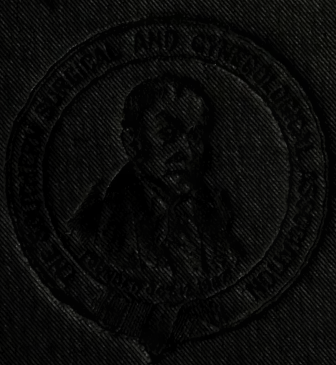

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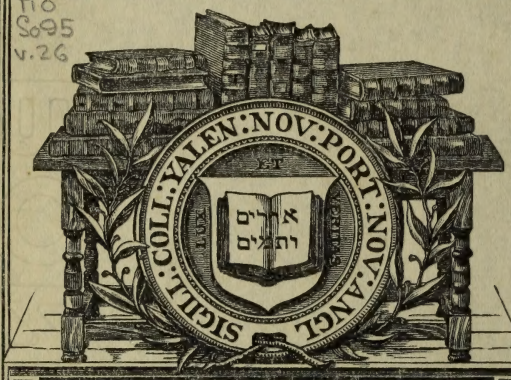

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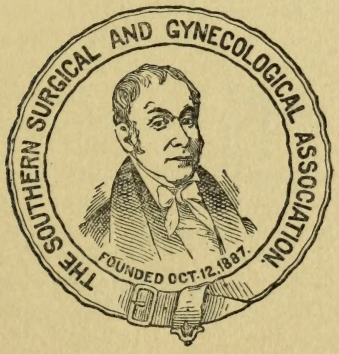

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1893.—Bloom, J. D., M.D. Consulting Surgeon, Touro Infirmary; Lecturer on Diseases of Children, Tulane University. New Orleans, La.

1901.—Boldt, Hermann J., M.D. Gynecologist to Post-Graduate Hospital, St. Mark's Hospital, German Polyclinic; Consulting Gynecologist to the Beth Israel Hospital and to St. Vincent's Hospital; Professor of Gynecology, Post-Graduate Medical School; Member of the Gynecological Society of Germany; Fellow of the American Gynecological Society; Fellow of the Royal Society of Medicine (London); ex-President of the New York Obstetrical Society; of the German Medical Society of New York; of the Section of Obstetrics of the New York Academy of Medicine. 39 East Sixty-first Street, New York, N. Y.

1902.—Bonifield, Charles Lybrand, M.D. Professor of Clinical Gynecology, Medical College of Ohio (Medical Department University of Cincinnati); Member American Association of Obstetricians and Gynecologists; ex-President Cincinnati Academy of Medicine; ex-President Cincinnati Obstetrical Society. 409 Broadway, Cincinnati, Ohio.

1911.—Borden, W. C., M.D. Professor of Surgery and Dean, George Washington University; Surgeon-in-Chief to the George Washington University Hospital. 1801 California St., Washington, D.C.

1890.—Bosher, Lewis Crenshaw, M.D. Professor of Practice of Surgery and Clinical Surgery in the Medical College of Virginia; Visiting Surgeon to the Memorial Hospital; Member of American Surgical Association; Member of the

American Association of Obstetricians and Gynecologists; Member of Association of American Anatomists; Member of American Urological Association; ex-President of Richmond Academy of Medicine and Surgery. *Vice-President*, 1901; *President*, 1905. 422 East Franklin Street, Richmond, Va.

1895.—Bovée, J. Wesley. M.D. Fellow of American Gynecological Society; President of Washington Obstetrical and Gynecological Society; ex-President Medical and Surgical Society of the District of Columbia; Honorary Fellow Medical Society of Virginia; Professor of Gynecology of George Washington University, Washington, D. C.; Gynecologist to Providence, Columbia, and George Washington University Hospitals; Consulting Physician to St. Ann's Infant Asylum, and Attending Gynecologist to St. Elizabeth's Hospital for the Insane, Washington, D. C. *Vice-President*, 1902; *President*, 1903; Member of *Council*, 1903-1906. The Rochambeau, Washington, D. C.

1905.—Brown, John Young, M.D. Formerly Surgeon-in-Charge, St. Louis City Hospital; President of the American Association of Obstetricians and Gynecologists, 1906. *Vice-President*, 1909; *President*, 1013. Metropolitan Building, St. Louis, Mo.

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1904.—Chambers, P. F., M.D. Attending Surgeon, Woman's Hospital; Consulting Surgeon, French Hospital. 49 West Fifty-seventh Street, New York, N. Y.

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1897.—Dorsett, Walter B., M.D. Professor of Obstetrics and Clinical Gynecology, St. Louis University; Gynecologist to the Missouri Baptist Sanitarium and to Evangelical Deaconess' Hospital. 5070 Washington Boulevard St. Louis, Mo.

1896.—Doughty, W. H., M.D. Professor of Special Surgery and Surgical Pathology, Medical Department, University of Georgia; Chief Surgeon to Charleston and Western Carolina Railroad. 822 Greene Street, Augusta, Ga.

1890.—Earnest, John G., M.D. Professor of Clinical Gynecology, College of Physicians and Surgeons; formerly Professor of Gynecology, Southern Medical College; Visiting Gynecologist to the Grady Hospital. 828 Candler Building, Atlanta, Ga.

1907.—Elbrecht, Oscar Herman, M.D. Superintendent and Surgeon-in-Charge of St. Louis Female Hospital; Vice-President, St. Louis Obstetrical and Gynecological Society; Visiting Surgeon on City Hospital Staff. Metropolitan Building, St. Louis, Mo.

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1905.—Frank, Louis, M.D. Professor of Surgery and Clinical Surgery, University of Louisville; Visiting Surgeon to the Louisville City Hospital. 400 Atherton Building, Louisville, Ky.

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1895.—Fry, Henry D., M.D. Professor of Obstetrics, Georgetown University; *Vice-President*, 1908. 1601 Connecticut Avenue, N. W., Washington, D. C.

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1896.—Haggard, William David, M.D. Professor of Surgery and Clinical Surgery, Vanderbilt University. *Treasurer,* 1900; *Secretary.* 184 Eighth Avenue, N., Nashville, Tenn.

1910.—Hagner, Francis Randall, M.D. Professor of Genito-urinary Surgery, George Washington University; Attending Genito-urinary Surgeon, George Washington University Hospital; Attending Surgeon, Garfield Memorial Hospital. The Farragut, Washington, D. C.

1892.—Hall, Rufus Bartlett, A.M., M.D. Professor of Clinical Gynecology in the Miami Medical College; Gynecologist to the Presbyterian Hospital; ex-President of the Cincinnati Obstetrical Society; ex-President of the American Association of Obstetricians and Gynecologists; Fellow of British Gynecological Society. 628 Elm Street, Cincinnati, O.

1910.—Hanes, Granville S., M.D. Professor of Surgery of the Rectum and Intestinal Diseases, Medical Department of the University of Louisville; Surgeon to the Louisville City Hospital. The Atherton Building, Louisville, Ky.

1901.—Hazen, Charles M., M.D. Professor of Physiology, Medical College of Virginia. Bon Air (Richmond), Va.

1896.—Heflin, Wyatt, M.D. Ex-President of the Jefferson County Medical Society. Birmingham, Ala.

1905.—Hendon, George A., M.D. Professor of Surgery and Clinical Surgery, University of Louisville. 968 Baxter Avenue, Louisville, Ky.

1889.—Hill, Robert Somerville, M.D. Gynecologist to the Laurel Hill Hospital; Senior Councillor of the Medical Association of the State of Alabama; ex-President of the Montgomery County Medical and Surgical Association; former Surgeon of the Second Regiment, Alabama State Militia. Montgomery, Ala.

1902.—Hirst, Barton Cooke, M.D. Professor of Obstetrics, University of Pennsylvania; Fellow of College of Physicians, Philadelphia; Gynecologist to the Howard, Orthopedic, and Philadelphia Hospitals; Fellow of American Gynecological Society. 1821 Spruce Street, Philadelphia, Pa.

1911.—Hogan, Edgar P., M.D. 800 South Twentieth St., Birmingham, Ala.

1913.—Hodgson, Fred. G., M.D. Atlanta, Ga.

1906.—Holden, Gerry R., M.D. Formerly House Surgeon, Roosevelt Hospital, New York City; formerly Resident Gynecologist, Johns Hopkins Hospital, and Assistant in Gynecology, Johns Hopkins Medical School. 223 West Forsyth Street, Jacksonville, Fla.

1891.—Holmes, J. B. S., M.D. Ex-President of the Tri-State Medical Society of Alabama, Georgia, and Tennessee, ex-President of the Georgia Medical Association; Fellow of the American Association of Obstetricians and Gynecologists. *Vice-President*, 1894. Tampa Bay Hotel Park, Tampa, Fla.

1900.—Horsley, John Shelton, M.D. Professor of Principles of Surgery and Clinical Surgery, Medical College of Virginia; Surgeon to Memorial Hospital. *Vice-President*, 1904. 617 West Grace Street, Richmond, Va.

1896.—Hundley, J. Mason, M.D. Associate Professor of Diseases of Women and Children, University of Maryland; President Clinical Society of Baltimore. 1009 Cathedral Street, Baltimore, Md.

1903.—Hunner, Guy Le Roy, M.D. Associate in Gynecology, Johns Hopkins University; Professor of Genito-Urinary Surgery, Woman's Medical College of Baltimore; Gynecologist-in-Chief, St. Agnes' Hospital; Visiting Gynecologist, Church Home and Hebrew Hospital, Baltimore, Frederick City Hospital, Frederick, Md., and Hagerstown

Hospital, Hagerstown, Md.; Consulting Gynecologist, Brattleboro Memorial Hospital, Brattleboro, Vt. *Vice-President*, 1911. 2305 St. Paul Street, Baltimore, Maryland.

1900.—Ill, Edward Joseph, M.D. Surgeon to the Woman's Hospital; Medical Director, St. Michael's Hospital Gynecologist and Supervising Obstetrician, St. Barnabas' Hospital; Consulting Gynecologist to German Hospital and Beth Israel Hospital of Newark, N. J.; to All Souls' Hospital, Morristown, N. J., and to Mountain Side Hospital, Montclair N. J.; Vice-President from New Jersey to Pan-American Congress of 1893. 1002 Broad Street, Newark, N. J.

1908.—Irvin, James S., M.D. Danville, Va.

1912.—Jackson, William R., M.D. Professor of Surgery to the Medical Department of the University of Alabama; Consulting Surgeon to the City Hospital and Southern Infirmary, Mobile, Ala. 164 St. Michael Street, Mobile, Ala.

1889.—Johnson, Joseph Taber, M.D. Professor of Gynecology and Abdominal Surgery, Georgetown University; formerly Gynecologist to Providence Hospital; Chief of Service of Gynecology and Abdominal Surgery, Georgetown University Hospital, and President of the Board of Administration; President of the Woman's Dispensary, and of the Medical Society of the District of Columbia (1887); Member of the British Medical Association; Fellow of the Gynecological Society; President of the Washington Obstetrical and Gynecological Society; Secretary American Gynecological Society, 1886–1890, and President, 1899. *Vice-President*, 1896. *President*, 1899. 926 Farragut Sq., Washington, D. C.

Founder.—Johnston, George Ben, M.D. Formerly Consulting Surgeon to the Richmond Eye, Ear, and Throat Infirmary; ex-President of the Richmond Academy of Medicine and Surgery; ex-President of the Medical Society of Virginia; Member of the American Association of Obstetricians and Gynecologists, and First Vice-President, 1896; Member of the Ninth International Medical Congress; Member of the American Surgical Association; Professor of the Practice of Surgery and Clinical Surgery in the Medical College of Virginia, and formerly Professor of Anatomy; Surgeon to the Old Dominion Hospital; Consulting Surgeon to the City Free Dispensary. *Vice-President*, 1892; *President*, 1897. 407 East Grace Street, Richmond, Va.

1908.—Jonas, Ernst, M.D. Clinical Professor of Surgery, Medical Department, Washington University; Chief of Surgical Clinic, Washington University Hospital; Gynecologist to the Jewish Hospital; Surgeon to the Martha Parsons Hospital for Children; Fellow of the American Association of Obstetricians and Gynecologists. 4495 Westminster Place, St. Louis, Mo.

1910.—Jones, Edward Groves, A.B., M.D. Professor of Surgery, Atlanta School of Medicine; Surgeon to Tabernacle Infirmary; Gynecologist to Wesley Memorial Hospital. Fourth National Bank Building, Atlanta, Ga.

1902.—Jordan, William Mudd, M.D. Surgeon to St. Vincent's Hospital; Gynecologist to Hillman Hospital; formerly Assistant Surgeon, U. S. Marine Hospital Service. Birmingham, Ala.

1912.—Judd, Edward Starr, M.D. Surgeon to St. Mary's Hospital, Rochester, Minn.

1890.—Kelly, Howard Atwood, M.D. Founder of Kensington Hospital, Philadelphia; Associate Professor of Obstetrics, University of Pennsylvania, 1888-89; Professor of Gynecology and Obstetrics, Johns Hopkins University, 1888-99; Professor of Gynecology, Johns Hopkins University; Gynecologist-in-Chief to Johns Hopkins Hospital; Member Associé Etranger de la Société Obstétricale et Gynécologique de Paris; Correspondirendes Mitglied der Gesellschaft f. Geburtshülfe zu Leipzig; Honorary Fellow Edinburgh Obstetrical Society, Royal Academy of Medicine (Ireland), and British Gynecological Society; Member Washington Academy of Sciences; Fellow of the American Gynecological Society. *President*, 1907. 1418 Eutaw Place, Baltimore, Maryland.

1907.—Kirchner, Walter C. G., M.D. Formerly Surgeon-in-Charge, St. Louis City Hospital. 508 Metropolitan Building, St. Louis, Mo.

1899.—Kohlman William, M.D. 3500 Prytania Street New Orleans, La.

1913.—La Roque, G. Paul, M.D. Richmond, Va.

1894.—Leigh, Southgate, M.D. Visiting Surgeon to St. Vincent's and Norfolk Protestant Hospitals; First Vice-President Medical Society of Virginia, 1899-1900. 147 Granby Street, Norfolk.

1912.—Lewis, Bransford, M.D. Century Building, St. Louis, Mo.

1893.—Lewis, Ernest S., M.D. Professor of Gynecology, Medical Department of Tulane University. *Vice-President*, 1895; *President*, 1896; *Member of Council*, 1896-1903. 124 Baronne Street, New Orleans, La.

1900.—Lloyd, Samuel, M.D. Professor of Surgery, New York Post-Graduate Medical School; Attending Surgeon to the Post-Graduate Hospital and St. Francis' Hospital, and Consulting Surgeon to the Benedictine Sanitarium at Kingston, N. Y. 12 West Fiftieth Street, New York, N. Y.

Founder.—Long, John Wesley, M.D. Emeritus Professor of Gynecology and Pediatrics in the Medical College of Virginia; formerly Gynecologist to the Old Dominion Hospital and the Richmond City Dispensary; Member, ex-Orator, and ex-Vice-President of the North Carolina Medical Society. *Vice-President*, 1902. *President.* Greensboro, N. C.

1904.—Lupton, Frank A., M.D. 716 North Eighteenth Street, Birmingham, Ala.

1902.—McAdory, Wellington P., M.D. Surgeon to Hillman Hospital. Birmingham, Ala.

1911.—McGlannan, Alexius, M.D. Associate Professor of Surgery, College of Physicians and Surgeons, Baltimore. 114 West Franklin St., Baltimore, Md.

1895.—McGannon, M. C., M.D. Professor of Surgery and Clinical Surgery, Medical Department, Vanderbilt University; Chief Surgeon, Woman's Hospital. 118 Eighth Avenue, N., Nashville, Tenn.

1893.—McGuire, Stuart, M.D. Professor of the Principles of Surgery and Clinical Surgery, University College of Medicine; Surgeon-in-Charge, St. Luke's Hospital; Visiting Surgeon, Virginia Hospital; Consulting Surgeon, Virginia Home for Incurables. *Vice-President*, 1906; *Treasurer*, 1908; *President*, 1909. 518 East Grace Street, Richmond Va.

1891.—McGuire, W. Edward, M.D. Professor of Gynecology, University College of Medicine; Gynecologist to the Virginia Hospital. 411 East Grace Street, Richmond, Va.

1888.—McMurtry, Lewis S., M.D. Ex-President of the American Medical Association; Professor of Abdominal Surgery and Gynecology in the Medical Department of the University of Louisville; Surgeon to the Louisville City Hospital; Gynecologist to St. Mary and St. Elizabeth Hospital; Gynecologist to Gray Street Infirmary; ex-President of the Ameri-

can Association of Obstetricians and Gynecologists; ex-President of the Kentucky State Medical Society; Corresponding Member of the Gynecological Society of Boston; Fellow of the British Gynecological Society; Ordinary Fellow of the Edinburgh Obstetrical Society; Fellow of the American Surgical Society. *President*, 1891. Atherton Building, Fourth and Chestnut Streets, Louisville, Ky.

1888.—McRae, Floyd Willcox, M.D. Professor of Gastro-intestinal, Rectal, and Clinical Surgery, Atlanta College of Physicians and Surgeons; Surgeon to Grady Hospital; ex-President Medical Association of Georgia; ex-Secretary of Section on Surgery and Anatomy, American Medical Association. *Vice-President*, 1897; *Treasurer*, 1901–1903; *President*, 1904. Peters Building, Atlanta, Ga.

1905.—MacLean, Henry Stuart, M.D. Professor of Pathology, University College of Medicine. 406 West Grace Street, Richmond, Va.

1912.—Malone, Battle, M.D. 1701 Exchange Building, Memphis, Tenn.

1891.—Marcy, Henry Orlando, M.D., LL.D. Ex-President of the American Medical Association; President of the Section of Gynecology, Ninth International Medical Congress; late President of the American Academy of Medicine; Corresponding Member of the Medico-Chirurgical Society of Bologna, Italy; Fellow of the American Association of Obstetricians and Gynecologists. 180 Commonwealth Avenue, Boston, Mass.

1899.—Martin, E. Denegre, M.D. Professor of Surgery, Post-graduate Department, Tulane Medical College; Visiting Surgeon to Charity Hospital. *Vice-President*, 1906. 741 Carondelet St., New Orleans, La.

1909.—Martin, Frank, M.D. Clinical Professor of Surgery at the University of Maryland. 1000 Cathedral Street, Baltimore, Md.

1913.—Martin, Franklin H., M.D. Chicago, Ill.

1904.—Mason, J. M., M.D. Gynecologist to St. Vincent Hospital. 1915 Sixteenth Avenue, S., Birmingham Alabama.

1899.—Mastin, William M., M.D. Fellow of the American Surgical Association; Member of the American Association of Genito-urinary Surgeons; Surgeon to the Mobile City Hospital. Joachim and Conti Streets, Mobile, Alabama.

1893.—Matas, R., M.D. Professor of Surgery, Medical Department of Tulane University; Fellow of the American Surgical Association. *President*, 1911. 3523 Prytania St., New Orleans, La.

1896.—Matthews, William P., M.D. Professor of Anatomy, Medical College of Virginia; Orthopedic Surgeon to the Old Dominion Hospital. Richmond, Va.

1902.—Mayo, Charles H., M.D. Attending Surgeon, St. Mary's Hospital; Fellow American Surgical Society; ex-President, Western Surgical and Gynecological Association and of Minnesota State Medical Society. Rochester, Minn.

1899.—Michinard, P. E., M.D. 624 Gravier Street, New Orleans, La.

1888.—Miller, C. Jeff., M.D. Visiting Surgeon to Charity Hospital of Louisiana; Professor of Clinical Obstetrics and Clinical Gynecology in the Tulane University of Louisiana; Chief of the Division of Obstetrics, Gynecology and Abdominal Surgery of the Presbyterian Hospital. 1638 Joseph Street, New Orleans, La.

1907.—Mitchell, James F., M.D. Surgeon to Providence Hospital. *Vice-President.* 1344 Nineteenth Street, Washington, D. C.

1901.—Mixter, Samuel Jason, M.D. Surgeon, Massachusetts General Hospital; Consulting Surgeon, Massachusetts Charity Eye and Ear Infirmary; Instructor of Surgery, Harvard Medical School. 180 Marlborough St., Boston, Mass.

1910.—Moore, James E., M.D. Professor, and Chief of the Department of Surgery in the College of Medicine and Surgery of the University of Minnesota; Fellow and Ex-Vice-President of the American Surgical Association; Member and Ex-President of the Western Surgical Association; Member and Ex-chairman of the Surgical Section of the American Medical Association; Honorary member of the American Orthopedic Association. 704 Pillsbury Building, Minneapolis, Minn.

1911.—Moore, John Thomas, M.D. 612 Gray Avenue, Houston, Texas.

1904.—Moran, John F., M.D. Professor of Obstetrics, Georgetown University; Obstetrician to Georgetown University Hospital and Columbia Hospital for Women. 2426 Pennsylvania Avenue, Washington, D. C.

1902.—Morris, Lewis C., M.D. Professor of Anatomy and Associate Professor of Gynecology, Birmingham Medical College; Councillor of Medical Association, State of Alabama; Vice-President of Tri-State Medical Society of Alabama, Georgia, and Tennessee. *Vice-President,* 1910. 716 North Eighteenth Street, Birmingham, Ala.

1900.—Morris, Robert Tuttle, M.D. Professor of Surgery, New York Post-Graduate Medical School and Hospital. 616 Madison Avenue, New York, N. Y.

1901.—Mullally, Lane, M.D. Professor of Obstetrics and Diseases of Children, Medical College, State of South Carolina; Visiting Physician in Obstetrics and Pediatrics, Roper Hospital. Charleston, S. C.

1894.—Murphy, J. B., M.D. Ex-President American Medical Association; Professor of Surgery, Northwestern University; Professor of Surgery, Post-Graduate School and Hospital; Attending Surgeon, Cook County and Mercy Hospitals. 104 South Michigan Avenue, Chicago, Illinois.

1889.—Nicolson, William Perrin, M.D. Professor of Anatomy and Clinical Surgery, Atlanta College of Physicians and Surgeons; Visiting Surgeon to Grady Hospital; Senior Surgeon to Wesley Memorial Hospital; Senior Surgeon, St. Joseph Hospital. *Vice-President,* 1900. Healey Building, Atlanta, Ga.

1890.—Noble, George H., M.D. Dean and Professor of Abdominal Surgery and Clinical Gynecology, Atlanta School of Medicine; Gynecologist of Grady Hospital; Senior Gynecologist, Wesleyan Memorial Hospital, Atlanta; Fellow of the American Gynecological Association and the American Association of Obstetricians and Gynecologists; ex-President of the Medical Association of Georgia; ex-Secretary of the Section of Obstetrics, American Medical Association. *Vice-President,* 1901; *President,* 1906. 131 South Pryor Street, Atlanta, Ga.

1911.—Norris, Henry, M.D. Rutherfordton, North Carolina.

1902.—O'Brien, Matthew Watson, M.D. Surgeon, Southern and Chesapeake and Ohio Railways; Member of the American Association for the Advancement of Science. 908 Cameron Street, Alexandria, Va.

1901.—Ochsner, A. J., M.D. Adjunct Professor of Clinical Surgery, College of Physicians and Surgeons; Surgeon-in-Chief, Augustana and St. Mary's Hospital. 710 Sedgwick Street, Chicago, Ill.

1903.—Ochsner Edward H., M.D. Surgeon to Augustana and St. Mary's Hospital. 710 Sedgwick Street, Chicago, Illinois.

1904.—Oechsner, John F., M.D. Professor of Orthopedic Surgery and the Surgery of Children, Post-Graduate Medical Department, Tulane University of Louisiana; Visiting Surgeon, Charity Hospital. Macheca Building, New Orleans, Louisiana.

1902.—Oliver, John Chadwick, M.D. Dean and Professor of Operative Surgery, Miami Medical College; Surgeon to the Cincinnati, Christ, and Presbyterian Hospitals. 628 Elm Street, Cincinnati, Ohio.

1888.—Parham, F. W., M.D. Professor of Surgery in the New Orleans Polyclinic. *Vice-President*, 1899; *President*, 1908. 1429 Seventh Street, New Orleans, La.

1900.—Park, Roswell, M.D. Professor of Surgery, Medical Department, University of Buffalo; Surgeon, Buffalo General Hospital; Member of German Congress of Surgeons, Italian Surgical Society, American Surgical Association, American Orthopedic, and American Genito-urinary Associations. 510 Delaware Avenue, Buffalo, N. Y.

1910.—Payne, Robert Lee, Jr., M.D. Assistant Gynecologist to St. Vincent's Hospital; Surgeon to the Southern Railway; Consulting Surgeon to the Seaboard Air Line Railway. 300 Freemason St., Norfolk, Va.

1899.—Perkins, W. M., M.D. Chief of the Clinic Chair of General Clinical and Operative Surgery, New Orleans Polyclinic; Assistant Demonstrator of Operative Surgery, Medical Department, Tulane University of Louisiana; Visiting Surgeon to the Charity Hospital. 830 Canal Street, New Orleans, La.

1908.—Peterson, Reuben, A.M., M.D. Professor of Obstetrics and Gynecology, University of Michigan; Obstetrician and Gynecologist-in-Chief to the University of Michigan Hospital. Ann Arbor, Mich.

1899.—Platt, Walter Brewster, M.D. Surgeon to the Robert Garrett Hospital for Children. 802 Cathedral Street, Baltimore, Md.

1889.—Polk, William M., M.D. Dean and Professor of Obstetrics and Gynecology, Cornell University Medical College; Gynecologist to Bellevue Hospital; Consulting Surgeon to St. Luke's, St. Vincent's, New York Lying-in, and Trinity Hospitals; ex-President of American Gynecological Society, and New York Obstetrical Society. 7 East Thirty-sixth Street, New York.

1900.—Porter, Miles F., M.A., M.D. Surgeon to Hope Hospital; Professor of Surgery, Indiana University School of Medicine. 47 West Wayne Street, Fort Wayne, Ind.

1900.—Ransohoff, Joseph, M.D., F.R.C.S. Professor of Anatomy and Clinical Surgery, University of Cincinnati; Surgeon to Cincinnati, Good Samaritan, and Jewish Hospitals; Member American Surgical Association. 19 West Seventh Street, Cincinnati, Ohio.

1911.—Reder, Francis, M.D. Delmar Building, St. Louis, Mo.

1890.—Reed, Charles Alfred Lee, M.D. Ex-President of the American Medical Association; Professor of Gynecology and Abdominal Surgery in the Cincinnati College of Medicine and Surgery; Surgeon to the Cincinnati Free Hospital for Women; Fellow of the American Association of Obstetricians and Gynecologists; Fellow of the British Gynecological Society; ex-Chairman of the Section on Obstetrics and Diseases of Women of the American Medical Association; Secretary-General of the Pan-American Medical Congress, 1893; Honorary Member of the Medical Society of the State of New York. 19 W. Seventh Street, Cincinnati, Ohio.

1912.—Richardson, Edward P., M.D. Surgeon to Outpatients, Massachusetts General Hospital, and Surgeon to the Robert B. Brigham Hospital for Chronic Diseases. 224 Beacon Street, Boston, Mass.

1888.—Roberts, William O., M.D. Professor of Principles of Surgery and Clinical Surgery, Medical Department of the University of Louisville; formerly Secretary of the Surgical Section of the American Medical Association. *President*, 1910; *Vice-President*, 1889. Atherton Building, Louisville, Ky.

1901.—Robins, Charles Russell, M.D. Professor of Gynecology, Medical College of Virginia; Gynecologist to the Memorial Hospital; Surgeon to the Atlantic Coast Railroad. 8 West Grace Street, Richmond, Va.

1889.—Robinson, William Lovaille, M.D. Fellow of the American Association of Obstetricians and Gynecologists; ex-President of the Danville Medical Society; Member of the Medical Examining Board of Virginia; ex-President of Virginia Medical Society. *Vice-President*, 1899. 753 Main Street, Danville, Va.

1906.—Rogers, Carey Pegram, M.D. Chief of Surgical Staff, St. Luke's Hospital; Consulting Surgeon, Sea Board Air Line Railway. 221 Laura Street, Jacksonville, Fla.

1901.—Rogers, Mack, M.D. Professor of Anatomy, Birmingham Medical College. 212 Twentieth Street, Birmingham, Ala.

1901.—Rosser, Charles M., M.D. Professor of Surgery, Baylor University, College of Medicine; Consulting Surgeon, Parkland Hospital; Attending Surgeon, Texas Baptist Memorial Sanitarium; ex-Vice-President Texas State Medical Association; Vice-President, Tri-State Society of Texas, Louisiana and Arkansas. *Treasurer*, 1904–07. 432 Gaston Avenue, Dallas, Texas.

1899.—Royster, Hubert Ashley, A.B., M.D. Surgeon to Rex Hospital; Surgeon-in-Chief, St. Agnes' Hospital; Surgeon to Southern Railway. *Vice-President*, 1907. 423 Fayetteville Street, Raleigh, N. C.

1909.—Ruffin, Kirkland, M.D. Surgeon-in-Charge of St. Christopher's Hospital. 218 York Street, Norfolk, Va.

1901.—Runyan, Joseph P., M.D. 203 West Second Street, Little Rock, Ark.

1908.—Russell, Wm. Wood, M.D. Associate Professor of Gynecology, Johns Hopkins University; Associate in Gynecology, Johns Hopkins Hospital; Gynecologist to Union Protestant Infirmary, Baltimore. 1208 Eutaw Place, Baltimore, Md.

1893.—Saunders, Bacon, M.D. Professor of Surgery and Clinical Surgery and Dean of Faculty of Medical Department, Fort Worth University; ex-President, Texas State Medical Association. *Vice-President*, 1903; *Member of Council*, 1908. Ninth and Houston Streets, Fort Worth, Texas.

1910.—Schachner, August, M.D. 844 Fourth Avenue, Louisville, Ky.

Founder.—Schilling, Nicholas M.D. Cedar Bayou, Tex.

1907.—Scott, Arthur Carroll, M.D. Senior Surgeon, Temple Sanatorium. *Vice-President.* Temple, Texas.

1899.—Shands, A. R., M.D. Professor of Orthopedic Surgery in the Medical Department of the George Washington University and in the University of Vermont; Orthopedic Surgeon to the George Washington University Hospital, the Emergency Hospital, and Central Dispensary; Charter Member Washington Academy of Sciences; Member American Orthopedic Association; and Honorary Member of Medical Society of Virginia. 901 Sixteenth Street, N. W., Washington, D. C.

1902.—Sherrill, J. Garland, M.D. Professor of Surgery and Clinical Surgery, University of Louisville; Consulting Surgeon to Louisville Hospital. *Vice-President*, 1911. Atherton Building, Louisville, Ky.

1900.—Simpson, Frank Farrow, M.D. Assistant Gynecologist, Mercy Hospital; Gynecologist to Out-patient Department, Mercy Hospital. Jenkins Arcade Bldg., Pittsburgh, Pa.

1913.—Simpson, James Knox, M.D. Jacksonville, Fla.

1899.—Smythe, Frank David, M.D. Gynecologist to St. Joseph's and City Hospitals; Professor of Gynecology, Didactac and Clinical, in the Memphis Hospital Medical College; Ex-President West Tennessee Medical and Surgical Association; formerly Member of the Mississippi State Board of Health and State Board of Medical Examiners of Mississippi. Porter Building, Memphis, Tenn.

1904.—Stokes, James Ernest, M.D. Salisbury, N. C.

Founder.—Stone, Isaac Scott, M.D., ScD. Professor of Gynecology, Georgetown University; Gynecologist to Columbia and Georgetown University Hospitals; Fellow of the American Gynecological Society; Fellow of the Royal Society of Medicine, London, England. *Vice-President*, 1905. 1618 Rhode Island Avenue, N. W., Washington, D. C.

1894.—Talley, Dyer F., M.D. Associate Professor of Surgery, Birmingham Medical College; Attending Surgeon to Hillman Hospital; Surgeon to the Talley and McAdory Infirmary; Ex-President of the Jefferson County Medical Society; Member of the Southern Medical Association; Member of the Pan-American Medical Association; Member of the Alumni Association of the Charity Hospital of Louisiana; Member of the Board of Censors of the Jefferson County Medical Society; Member of the Alabama State Board of Censors, Committee of Public Health and Examiners; Fellow of the American Association of Obstetricians and Gynecologists. 1801 Seventh Avenue, Birmingham, Ala.

Founder.—Taylor, Hugh M., M.D. Professor of Practice of Surgery and Clinical Surgery, University College of Medicine; Surgeon to the Virginia Hospital; ex-President of the Virginia Board of Medical Examiners. 6 North Fifth Street, Richmond, Va.

1898.—Taylor, William Wood, A.B., M.D. Gynecologist to the Lucy Brinkley and the Memphis City Hospitals. 206 Randolph Building, Memphis, Tenn.

1892.—Thompson, J. E., M.D. Professor of Surgery in the University of Texas. *Vice-President,* 1912. Galveston, Tex.

1890.—Tompkins, Christopher, M.D. Professor of Obstetrics in the Medical College of Virginia. *Vice-President,* 1903. 116 East Franklin Street, Richmond, Va.

1908.—Torrance, Gaston, M.D. Member Surgical Staff Hillman's Hospital; also the Sisters' Hospital and St. Vincent's; Fellow of the American Association of Obstetricians and Gynecologists. 328 Woodward Building, Birmingham, Ala.

1909.—Trout, Hugh Henry, M.D. Surgeon-in-Chief of Jefferson Surgical Hospital, Roanoke, Va. 1303 Franklin Road, Roanoke, Va.

1888.—Tuholske, Herman, M.D. Professor of Surgery, Medical Department, Washington University; Consulting Surgeon, St. Louis City Hospital; Surgeon to St. Louis Polyclinic Hospital. 465 North Taylor Street, St. Louis, Missouri.

1912.—Turck, Raymond C., M.D. Consolidated Building, Jacksonville, Fla.

1905.—Vance, Ap Morgan, M.D. Surgeon to St. Mary and Elizabeth Hospital; Consulting Surgeon, Louisville City Hospital. *Vice-President,* 1913. 921 Fourth Street, Louisville, Ky.

1893.—Vander Veer, Albert, M.D. Professor of Clinical, Didactic, and Abdominal Surgery, Albany Medical College; ex-President of the American Surgical Association; ex-President of the American Association of Obstetricians and Gynecologists; ex-President of the Medical Society of the State of New York. 28 Eagle Street, Albany, New York.

1909.—Vaughan, George Tully, M.D. Professor of Surgery and Head of Department of Surgery in Georgetown University; Chief Surgeon in Georgetown University Hospital; Visiting Surgeon to the Emergency Hospital; Con-

sulting Surgeon to the Government Hospital for the Insane. 1718 I Street, Washington, D.C.

1891.—Walker, Edwin, M.D., Ph.D. Gynecologist to the Evansville City Hospital; ex-President Mississippi Valley Medical Association; President of the Indiana State Medical Society; Fellow of the American Association of Obstetricians and Gynecologists. 712 Upper Fourth Street, Evansville, Ind.

1912.—Walker, George, M.D. Associate in Surgery, Johns Hopkins University. 1 E. Centre St., Baltimore, Maryland.

1911.—Waring, T. P., M.D. Savannah, Ga.

1905.—Wathen, John R., A B., M.D. Professor of Principles and Practice of Surgery and Clinical Surgery, University of Louisville; Surgeon to St. Anthony's, Louisville City, and University of Louisville Hospitals. 628 Fourth Avenue, Louisville, Ky.

1898.—Watkins, Isaac Lafayette, M.D. Ex-President of the Montgomery County Medical and Surgical Society. Montgomery, Ala.

1907.—Watts, Stephen H., M.D. Professor of Surgery University of Virginia; Surgeon-in-Chief and Director of the University of Virginia Hospital. University of Virginia, Charlottesville, Va.

1901.—Werder, X. O., M.D. Gynecologist, Mercy Hospital, Pittsburgh: Professor of Gynecology, West Pennsylvania Medical College; Consulting Surgeon to the South Side Hospital, Allegheny General Hospital, St. Francis' Hospital, etc. 524 Pennsylvania Avenue, Pittsburgh, Pa.

1888.—Westmoreland, Willis F., M.D. Professor of Surgery, Atlanta College of Physicians and Surgeons. *Vice President*, 1908. 241 Equitable Building, Atlanta, Ga.

1913.—Williams, Espy M., M.D. Patterson, La.

1904.—Whaley, T. P., M.D. Lecturer on Genito-urinary and Renal Surgery, Charleston Medical School; Lecturer on Diseases of Skin, Medical College of State of South Carolina; Surgeon to Sherra's Dispensary; Visiting Surgeon, Charleston City Hospital. 13 Wentworth Street, Charleston, South Carolina.

1900.—Williams, J. Whitridge, A.B., M.D. Professor of Obstetrics, Johns Hopkins University; Obstetrician-in-Chief, Johns Hopkins Hospital; Gynecologist to the Union Protestant Infirmary. 1128 Cathedral Street, Baltimore, Md.

1907.—Willis, A. Murat, M.D. Instructor in Abdominal Surgery, Medical College of Virginia; Junior Surgeon to Memorial Hospital, Richmond, Va. 405 East Grace Street, Richmond, Va.

1913.—Windell, J. T., M.D. Louisville, Ky.

1905.—Winslow, Randolph, M.D., LL.D. Professor of Surgery, University of Maryland; Chief Surgeon, University Hospital; Consulting Surgeon, Hebrew Hospital, and to Hospital for Crippled Children. 1900 Mt. Royal Terrace, Baltimore, Md.

1905.—Witherspoon, T. Casey, M.D. Formerly Professor of Operative and Clinical Surgery, Medical Department, St. Louis University; Member of American Association of Anatomists. 307 West Granite Street, Butte, Mont.

1900.—Wysor, John C., M.D. Surgeon-in-Charge, Chesapeake and Ohio Hospital. Clifton Forge, Va.

1900.—Young, Hugh H., M.D. Chief of Clinic, Genito-urinary Surgery, Johns Hopkins Hospital. 330 North Charles Street, Baltimore, Md.

1902.—Zinke, E. Gustav, M.D. Professor of Obstetrics and Clinical Gynecology in the Ohio-Miami Medical College, the Medical Department of the Cincinnati University; Obstetrician and Gynecologist to German Protestant Hospital; Attending Obstetrician to Ohio Maternity; ex-President of American Association of Obstetricians and Gynecologists. 4 West Seventh Street, Cincinnati, Ohio.

CONSTITUTION

ARTICLE I

The name of this Association shall be THE SOUTHERN SURGICAL AND GYNECOLOGICAL ASSOCIATION.

ARTICLE II

The object of this Association is to further the study and practice of surgery and gynecology among the profession of the Southern States.

ARTICLE III

This Association shall adopt and conform to the Code of Ethics of the American Medical Association.

ARTICLE IV

SECTION 1. Any reputable physician who practises surgery or gynecology, and who is vouched for by two members of the Association and recommended by the Council, shall be eligible to membership in this body.

SEC. 2. The honorary members shall not exceed twenty-five in number, and shall enjoy all the privileges of other members, excepting to vote or hold office, but shall not be required to pay any fee.

ARTICLE V

SECTION 1. The officers of this Association shall be a President, two Vice-Presidents, a Secretary, a Treasurer, and a Council, elected by ballot.

SEC. 2. The President and Vice-Presidents shall be elected for one year, and the President shall not be eligible for reëlection at any time; the Secretary and Treasurer, each, for five years; and the Council as provided for in the By-laws.

ARTICLE VI

SECTION 1. It shall be the duty of the President to preside at all meetings of the Association; to give the casting vote; to see that the rules of order and decorum be properly enforced in all deliberations of the Association; to sign the approved proceedings of each meeting, and to approve such orders as may be drawn upon the Treasurer for expenditures ordered by the Association.

SEC. 2. In the absence of the President the first Vice-President shall preside, and in his absence the second Vice-President shall preside.

SEC. 3. In the absence of all three, the Association shall elect one of its members to preside *pro tem.*

SEC. 4. It shall be the duty of the Secretary to keep a true and correct record of the proceedings of the meetings; to preserve all books, papers, and articles belonging to the archives of the Association; to attest all orders drawn on the Treasurer for moneys appropriated by the Association; to keep the account of the Association with its members; to keep a register of the members, with the dates of their admission and places of residence. He shall collect all moneys due from the members and pay to the Treasurer, taking his receipt for the same. He shall report such unfinished business of previous meetings as may appear on his books requiring action, and attend to such other business as the Association may direct. He shall also supervise and conduct all the correspondence of the Association, and edit the TRANSACTIONS under the direction of the Council.

SEC. 5. It shall be the duty of the Treasurer to keep a correct record of all moneys received from the hands of the Secretary, giving his receipt for the same; pay them out by order of the Association as indorsed by the President and attested by the seal in the hands of the Secretary.

SEC. 6. It shall be the duty of the President of the Association to appoint an Auditing Committee, consisting of three members of the Association, whose duty it shall be to examine the books of the Secretary and Treasurer, and report on the same on the last day of the session.

ARTICLE VII

Vacancies occurring in the offices of the Association shall be filled by appointment of the President until the next meeting. He shall also have the appointment of all committees not otherwise provided for.

ARTICLE VIII

This Constitution shall take effect immediately from the time of its adoption, and shall not be amended except by a written resolution, which shall lie over one year, and receive a vote of two-thirds of the members present.

ARTICLE IX

The membership of the Association shall be limited to two hundred.

BY-LAWS

ARTICLE I

The Southern Surgical and Gynecological Association shall meet annually on the Tuesday of the week preceding the week in which Christmas occurs, at 10 A.M., at such place as may be designated at the preceding meeting.

ARTICLE II

The members present shall constitute a quorum for business.

ARTICLE III

The annual dues of each member shall be $10, paid in advance.

ARTICLE IV

The usual parliamentary rules governing deliberative bodies shall govern the business workings of this Association.

ARTICLE V

All questions before the Association shall be determined by a majority of the votes present.

ARTICLE VI

The President shall deliver an annual address at each meeting of the Association.

ARTICLE VII

The Secretary of the Association shall receive at each annual Session a draft from the President, drawn on the Treasurer, for the sum of $500, for services rendered the Association, and to this shall be added the necessary expense incurred in the discharge of his official duties.

ARTICLE VIII

It shall be the duty of the Secretary, one month prior to the annual meeting, to notify the members of the Association and urge their attendance.

ARTICLE IX

The authors of papers shall notify the Secretary, six weeks prior to the meeting, of the titles of their essays, so that they may be incorporated in the preliminary programme.

ARTICLE X

COUNCIL

The Council shall consist of five members; and of those elected at the primary meeting, the first shall serve five years the second four, the third three, the fourth two, and the fifth one year; so that subsequently one member of the Council shall be elected annually to serve five years. No member of the Council shall be eligible for reëlection. The President and Secretary shall be *ex-officio* members of the Council.

This Council shall organize by electing a Chairman and Secretary, and shall keep a record of its proceedings.

The duties of this Council shall be—

1. To investigate applications for membership and report to the Association the names of such persons as are deemed worthy.

2. To take cognizance of all questions of an ethical, judicial, or personal nature, and upon these the decision of the Council shall be final; *provided,* that appeal may be taken from such decision of the Council to the Association, under a written protest, which protest shall be sustained by the Association, and the matter shall then be referred to a special committee, with power to take final action.

3. All motions and resolutions before the Association shall be referred to the Council without debate, and it shall report by recommendation at as early an hour as possible.

ARTICLE XI

The President shall appoint at each annual meeting a Committee of Arrangements.

ARTICLE XII

The Council shall have full power to omit from the published TRANSACTIONS, in part or in whole, any paper that may be referred to it by the Association, unless specially instructed to the contrary by the Association, which will be determined by vote.

ARTICLE XIII

Any member failing to pay his dues for more than one year shall be dropped.

ARTICLE XIV

No paper shall be read before this Association which does not deal strictly with a subject of surgical or gynecological importance.

ARTICLE XV

No paper read before this Association shall be published in any medical journal or pamphlet for circulation, as having been read before the Association, without having received the indorsement of the Council.

ARTICLE XVI

The reading of papers shall be limited to twenty minutes each, except by permission of the Association.

MINUTES OF THE PROCEEDINGS

AT THE

TWENTY-SIXTH ANNUAL MEETING

OF

THE SOUTHERN

SURGICAL AND GYNECOLOGICAL

ASSOCIATION

HELD AT THE

GEORGIAN TERRACE HOTEL

Atlanta, Georgia

DECEMBER 16, 17, AND 18, 1913.

TWENTY-SIXTH ANNUAL MEETING

FIRST DAY.—*Tuesday* 16, 1913.

The following named members were present:

ABELL, IRVIN
BAKER, JAMES NORMENT
BARR, RICHARD ALEXANDER
BLAIR, VILRAY P.
BOLDT, HERMAN J.
BOSHER, LEWIS CRENSHAW
BROWN, JOHN YOUNG
BURCH, LUCIUS E.
BYFORD, HENRY T.
CALDWELL, C. E.
CATHCART, R. S.
CLARK, JOHN G.
CLARK, S. M. D.
COFFEY, ROBERT C.
COLE, HERBERT PHALON
CRILE, GEORGE W.
CULLEN, THOMAS S.
CUNNINGHAM, RUSSELL M.
DANNA, JAMES A.
DAVIS, JOHN D. S.
DOUGHTY, W. H.
EARNEST, JOHN G.
ELKIN, WILLIAM SIMPSON
FINNEY, J. M. T.
FORT, RUFUS E.
FRANK, LOUIS
FRIEBERG, ALBERT H.
GOLDSMITH, W. S.
GRANT, HORACE H.
GUERRY, LE GRAND
GWATHMEY, LOMAX
HAGGARD, WILLIAM DAVID
HAGNER, FRANCIS R.
HENDON, GEORGE A.
HILL, ROBERT SOMERVILLE
HORSLEY, JOHN SHELTON
HUNNER, GUY LEROY
ILL, EDWARD JOSEPH
IRVIN, JAMES S.
JONES, EDWARD G.
JUDD, EDWARD STARR
KIRCHNER, WALTER C. G.
LONG, JOHN W.
LUPTON, FRANK A.
MCGLANNAN, ALEXIUS
MACLEAN, HENRY STUART
MCRAE, FLOYD WILCOX
MALONE, BATTLE
MARCY, HENRY ORLANDO
MARTIN, EDMUND DENEGRE
MARTIN, FRANK
MASON, J. M.
MATAS, R.
MAYO, CHARLES H.

Mitchell, James F.
Mixter, Samuel Jason
Moore, James E.
Morris, Lewis C.
Mullally, Lane
Nicolson, William Perrin
Noble, George H.
Norris, Henry
Ochsner, A. J.
Payne, Robert Lee
Ransohoff, Joseph
Reder, Francis
Roberts, William O.
Rogers, Carey P.
Rogers, Mack
Rosser, Charles M.
Royster, Hubert A.
Saunders, Bacon
Schachner, August
Scott, Arthur Carroll
Sherrill, J. Garland
Smythe, Frank Davie
Stokes, James Ernest
Stone, Isaac Scott
Talley, D. F.
Trout, Hugh H.
Turck, Raymond C.
Vance, Ap Morgan
Vaughan, George Tully
Watkins, Isaac Lafayette
Westmoreland, Willis F.
Willis, A. M.
Winslow, Randolph
Wysor, John C.

Letters of regret and telegrams were received from the following gentlemen: Drs. T. P. Whaley, Herman Tuholski, G. E. Gavin, Robert T. Morris, L. S. McMurtry, W. B. Coley, Willard Bartlett, J. M. Mason, Stuart McGuire, and E. A. Balloch.

Morning Session.—The Association met at 9.30 A.M., and was called to order by Dr. F. W. McRae, Atlanta, Georgia, Chairman of the Local Committee of Arrangements, who said: You do not know what a pleasure it gives us to have you with us on this occasion. We are especially delighted to have so many present at the opening meeting, because I believe we are going to have one of the best meetings in the history of the Association.

We have not planned much formal entertainment, but there are two entertainments we wish you to remember. There will be a formal reception, dinner, and dance given to the members of the Association by the local members of the profession at 8.00 P.M., Wednesday, at the Piedmont Driving Club.

Tomorrow (Wednesday) at 1.00 o'clock the wives of the local members of the Association will entertain the visiting ladies at a luncheon at the Capital City Club.

It gives me very great pleasure to welcome you to Atlanta. It is a further pleasure for me to introduce to you your President, Dr. John Young Brown, of St. Louis, whom you know better than I do. (Applause.)

President Brown, in taking the Chair said: On behalf of the Fellows of the Association I wish to thank the local Chairmen of the Committee of Arrangements for the hearty welcome he has given us and the beautiful entertainments he has provided. I think we will enjoy them. (Applause.)

Dr. J. Shelton Horsley, Richmond, Virginia, moved that the President's address be made the special order for 3.00 o'clock, Wednesday afternoon.

Motion seconded and carried.

The Secretary presented the following list of the visiting surgeons and moved that they be extended the privileges of the floor and be invited to participate in the discussions, which motion was seconded and carried.

Dr. W. L. Rodman, Philadelphia, Pennsylvania.
Dr. Henry Sherck, Los Angeles, California.
Dr. Moore, Los Angeles, California.
Dr. C. N. Cowden, Nashville, Tennessee.
Dr. J. Knox Simpson, Jacksonville, Florida.
Dr. C. M. Barlow, Portsmouth, Virginia.
Dr. Walt. P. Conaway, Atlantic City, New Jersey.
Dr. Gordon K. Dickinson, Jersey City, New Jersey.
Dr. Jason Mixter, Boston, Massachusetts.
Dr. Warren A. Dennis, Minneapolis, Minnesota.
Dr. Harry P. Ritchie, St. Paul, Minnesota.
Dr. A. A. Law, St. Paul, Minnesota.
Dr. Brannon Hubbard, Montgomery, Alabama.
Dr. G. B. Rhodes, Cincinnati, Ohio.

Papers were read as follows:

1. "Successful Suture of Stab Wound in Right Ventricle of the Heart," by Dr. Joseph A. Danna, New Orleans, Louisiana.

2. "Direct Suture of the Brachial Artery for Traumatism; Restoration of Circulation; Subsequent Development of Ischemic Paralysis," by Dr. J. Garland Sherrill, Louisville, Kentucky.

3. "Surgical Repair of Bloodvessels; Its Technique, Uses and Limitations" (lantern slides), by Dr. J. Shelton Horsley, Richmond, Virginia.

These three papers were discussed together by Drs. Hill, Kirchner, Boldt, Stone, and discussion closed by the essayists.

4. "Elements Frequently Overlooked by Surgeons in the Treatment of Exophthalmic Goitre," by Dr. A. J. Ochsner, Chicago, Illinois.

This paper was discussed by Dr. Mayo, and in closing by the essayist.

5. "Accidental Injury to the Vena Cava During the Operation of Nephrectomy," by Dr. LeGrand Guerry, Columbia, South Carolina.

This paper was discussed by Drs. Hunner, Royster, Stone, Scott, Barr, Finney, Reder, Hagner, Blair, and in closing by the essayist.

On motion, the Association adjourned until 2.00 P.M.

Afternoon Session.—The Association reassembled at 2.00 P.M. and was called to order by the President.

6. "The Choice of Methods in Operating for Retroversion of the Uterus when the Abdominal Cavity is Opened," by Dr. Henry T. Byford, Chicago, Illinois.

Discussed by Drs. Coffey, Long, Boldt, Hill, and discussion closed by the author of the paper.

7. "Report of Two Cases of Formation of Artificial Vagina by Intestinal Transplantation," by Dr. Herman J. Boldt, New York City.

Discussed by Dr. Cullen.

8. "Adenomyoma Situated in the Rectovaginal Septum and Originating from the Uterus," by Dr. Thomas S. Cullen, Baltimore, Maryland.

9. "Hysterectomy," by Dr. A. C. Scott, Temple, Texas.

Discussed by Dr. Francis Reder.

10. "Further Notes on the Use of the Paquelin Cautery in Endocervicitis, with Special Reference to Its Value in Sterility," by Dr. Guy Leroy Hunner, Baltimore, Maryland.

This paper was discussed by Drs. Byford, Boldt, Noble, Clark, Cullen, Stone, Marcy, and in closing, by Dr. Hunner.

11. "Treatment of Fistula at the Vaginal Vault Following Radical Surgical Operation," by Dr. Howard A. Kelly, Balti-

more. (This paper was read by the Secretary in the absence of the author.)

Discussed by Drs. Martin, Marcy, Hunner, Stone, Cullen, and Noble.

On motion, the Association adjourned until 9.00 A.M. Wednesday.

SECOND DAY.—*December* 17, 1913.

Morning Session.—The Association met at 9.00 A.M. and was called to order by the President.

12. "Terminal Results of Biliary Obstruction," by Dr. Henry O. Marcy, Boston, Massachusetts.

13. "A Study of the Causes of Unsatisfactory Results Following Operation on the Biliary Tract," by Dr. J. M. T. Finney, Baltimore, Maryland.

These papers were discussed by Drs. Matas, Guerry, Moore, Ochsner, Mixter, Mayo, Rhodes, and in closing, by the author of the paper.

To fill a vacancy in the Council caused by the absence of Dr. Stuart McGuire, the President appointed Dr. George H. Noble, of Atlanta, Georgia.

The Chair likewise appointed as an auditing committee, Drs. R. S. Cathcart, George A. Hendon, and Hubert Royster.

14. "Ultimate Results of Eight Cases of Colectomy for Fecal Stasis," by Dr. John G. Clark, Philadelphia, Pennsylvania.

15. "Posterior Resection of Rectal Cancer with Preservation of Anus," by Dr. Charles H. Mayo, Rochester, Minnesota.

16. "Remarks on the Surgery of the Ileocecal Coil," by Dr. Francis Reder, St. Louis, Missouri.

These three papers were discussed by Drs. A. Schachner, Sherrill, Lond, Horsley, Royster, Coffey, and the discussion closed by Drs. Mayo and Reder.

17. "(1) A Rare Case of Retroperitoneal Cyst of the Appendix Vermiformis, with Illustrations. (2) The Route to the Gasserian Ganglion for Purposes of Medical and Surgical Anesthesia; a Demonstration of the Technique with Lantern Slides," by Dr. Rudolph Matas, New Orleans, Louisiana.

This paper was discussed by Drs. Caldwell and Blair.

18. "Cholecystectomy *vs.* Cholecystostomy, and a Method of Overcoming the Special Risks Attending Common Duct Operations," by Dr. George W. Crile, Cleveland, Ohio.

Discussed by Drs. Ochsner, Marcy, Winslow, and in closing, by the author of the paper.

19. "Heredity in Bone Lesions, with the Report of an Unusual Family History," by Dr. Joseph Ransohoff, Cincinnati, Ohio.

On motion, the Association adjourned until 2.00 P.M.

Afternoon Session.—The Association reassembled at 2.25 P.M. and was called to order by the First Vice-President, Dr. Ap Morgan Vance, Louisville, Kentucky.

20. "Infraction of the Second Metatarsal Bone; a Typical Fracture Hitherto Undescribed," by Dr. Albert H. Freiberg, Cincinnati, Ohio.

21. "Open Treatment of Fractures," by Dr. G. A. Hendon, Louisville, Kentucky.

22. President's address: "The Diagnosis and Surgical Technique to be Employed in the Handling of Acute Abdominal Conditions" (lantern illustrations), by Dr. John Young Brown, St. Louis, Missouri.

23. "Fractures of the Neck of the Femur" (lantern illustrations), by Dr. James E. Moore, Minneapolis, Minnesota.

24. "A Word in Behalf of the Open Operation for the Proper Fixation and Repair of Fractures" (lantern demonstration), by Dr. Frank Martin, Baltimore, Maryland.

The papers of Drs. Freiberg, Hendon, Moore, and Martin were then discussed together by Drs. Caldwell, Martin, Winslow, Sherrill, Ransohoff, McGlannan, Blair, and in closing, by the essayists.

25. "Clinical Suggestions Based Upon a Study of Primary, Secondary (Carcinoma) and Tertiary (Carcinoma) Epithelial Hyperplasia in the Breast," by Dr. William Carpenter MacCarty (by invitation), Rochester, Minnesota.

26. "The End Results After Operations for Carcinoma of the Breast," by Dr. E. S. Judd, Rochester, Minnesota.

These two papers were discussed by Drs. Rodman, Cullen, Horsley, Westmoreland, Haggard, and in closing, by the authors of the papers.

Dr. Thomas S. Cullen, Baltimore, moved that the Association give its approbation to the work which is being done by the American Association for the Control of Cancer.

Motion seconded and carried.

On motion, the Association adjourned until 9.30 A.M. Thursday.

THIRD DAY.—*December* 18, 1913.

Morning Session.—The Association met at 9.40 A.M. and was called to order by Vice-President Vance.

27. "Drainage of Hydrocephalus by the Lumbar Route: Meningocele Used as a Drainage Tube, with Report of Case," by Dr. H. P. Cole, Mobile, Alabama.

Discussed by Drs. Horsley, Mayo, and in closing, by the essayist.

28. "Pancreatic Surgery," by Dr. R. C. Coffey, Portland, Oregon.

Discussed by Drs. Mayo, Cullen, and in closing, by the essayist.

29. "Congenital Pyloric Stenosis," by Dr. James F. Mitchell, Washington, D. C.

Discussed by Drs. Mixter, Coffey, and in closing, by the essayist.

30. "Excision of the Clavicle and First Rib, with Report of Case," by Dr. R. E. Fort, Nashville, Tennessee.

Discussed by Drs. Mixter, Blair, Vaughan, Rodman, and in closing, by the essayist.

The Secretary presented the report of the Council, as follows:

REPORT OF THE COUNCIL.

1. The Council recommends with regret the acceptance of the resignations of Drs. Cristopher Tompkins and Charles P. Noble.

2. That the deaths of our Fellows, Drs. Frank B. Meriwether, Charles M. Rees, and T. J. Crofford be recorded in the annual volume of TRANSACTIONS.

3. That candidates for Fellowship be requested to give the President or Secretary in their applications the names of three Fellows, two of whom must be from his own state. The proper officers of the Association will then submit to the Council the data furnished by endorsers and by any others whom they may wish to consult.

4. The following gentlemen, out of 80 applicants, are nominated for Fellowship to fill the eight vacancies in the constitutional limitation, occurring from death, resignation and lapsing of dues:

Dr. A. Johnston Buist, Charleston, South Carolina.
Dr. R. L. Gibbon, Charlotte, North Carolina.
Dr. Fred G. Hodgson, Atlanta, Georgia.
Dr. Franklin H. Martin, Chicago, Illinois.
Dr. G. Paul La Roque, Richmond, Virginia.
Dr. James Knox Simpson, Jacksonville, Florida.
Dr. Espy M. Williams, Patterson, Louisiana.
Dr. J. T. Windell, Louisville, Kentucky.

5. The Council suggests that a telegram of sympathy be sent to Dr. Stuart McGuire in his recent illness, and congratulation on his restoration to health and activity.

6. That Asheville, North Carolina, be chosen as the next place of meeting, and that Dr. Hubert A. Royster be designated as Chairman of the Committee of Arrangements for the members in North Carolina.

7. That the vacancy on the Council occurring from the expiration of service of Dr. Bacon Saunders be filled by the retiring President, Dr. John Young Brown.

8. That the following officers are nominated for the ensuing year:

President—Dr. John W. Long, Greensboro, North Carolina.

Vice-Presidents—Dr. A. C. Scott, Temple, Texas; Dr. James F. Mitchell, Washington, D. C.

All of which is respectfully submitted.

BACON SAUNDERS,
GEORGE H. NOBLE,
W. O. ROBERTS,
RUDOLPH MATAS,
J. M. T. FINNEY.

Dr. John D. Davis moved that the report of the Council be accepted and adopted.

Motion seconded and carried.

The President appointed Dr. John D. S. Davis and Dr. R. M. Cunningham as a committee to escort the newly elected President to the platform.

Dr. Cunningham, in presenting the newly elected President to the Association said: In looking at Dr. Long one would not consider that he is one of the foundation stones of this splendid Association, but he is. He is one of the founders. I am sure there is no Fellow of this Association but what points with pride to its history and achievements; hence those who were engaged early in its foundation have been its ardent supporters since the organization, and they have been engaged in a grand and noble work. Dr. Long, of Greensboro, one of its founders, has been almost a constant attendant upon our meetings. He has contributed many valuable papers to the Association and has participated actively and effectually in the discussions, and I am sure that this Association is honoring him for his trustworthiness, his scientific attainments, and his skill, knowing that he will faithfully discharge the duties of President of this Association. (Applause.)

Dr. John W. Long, Greensboro, North Carolina.—Mr. President, Ladies and Gentlemen: This is one time that I scarcely know what to say. I confess that one of the greatest ambitions of my life has been to be President of the Southern Surgical and Gynecological Association. And who will say this is not "a laudable ambition?" Yet, I have been content to wait till it came to me unsought, since my belief has always been that to be worthy of any position is more desirable than is the mere possession of the office.

Now that this great distinction has come to me, I find myself asking the question, "Why? Why am I thus honored by my Fellows when they are so much more deserving than I?" I think I understand the reason, and I trust it may be an inspiration to others.

Let us glance at the history of the Association. When on the invitation of that distinguished and ever-to-be-lamented physician and surgeon, Dr. W. E. B. Davis, sixty-three southern physicians, few of whom could be called "surgeons" according to the modern acceptation of the term, joined themselves together to organize a Southern Surgical and Gynecological Association, who would have thought that in the short span of twenty-six years fifty-five of those founders would "be taken," to use a Bible phrase, and only eight left?

However, much as we deplore this irreparable loss, our sorrow is mollified by the thought that they wrote their names upon the page of history in letters of gold. And some day, perhaps in the "dim and distant future," the surgical historian will ask, "Who are they who, by their foresight, wisdom, and experience, conceived, projected, and maintained this institution, which has done more, and I speak advisedly, to establish surgery and gynecology upon a scientific, rational, and ethical basis than any similar organization in the United States, or elsewhere?" If any man doubts the scope and magnitude of the work already accomplished by this Association, let him study the general index appended to the twenty-fifth volume of its TRANSACTIONS.

Now then, if you will pardon my audacity in projecting my insignificant self upon this glorious page of history, I will say that if I have done anything to merit the honor I am receiving at your hands, it is that through all these years I have been loyal to this Society. Both in season and out of season, I have thrown up my hat for the Southern Surgical and Gynecological Association. I yield to no man in the point of unswerving allegiance to this idol of my heart.

And through it all I have had much pleasure as well as profit. Some one suggested that I know almost everyone here. Why should I not? For more than a quarter of a century a few of these men have been my boon companions. Many of them for ten, fifteen, and twenty years; and numbers of the younger men I have in a surgical sense, maybe only in a small way,

helped to rear. I see before me at least a score of men, perhaps there are twice that number altogether, whose feet I have guided into this surgical fold. I think I have encouraged some of them to put forth their best efforts. A few of them I have boosted when they were weak, and now they are strong.

And today, when the Southern Surgical and Gynecological Association is riding upon the crest of the highest wave of her popularity and usefulness, when she is developing her own men by leaps and bounds, when by virtue of her own inherent strength she is drawing into her bosom surgical giants from the North, East, and West, when the eyes of the surgical world are focused upon her, you have asked me, who are the least worthy of the remnant of the old guard to preside over her deliberations?

The very contemplation of the responsibilities of the position humble and chasten my spirit. I would feel utterly unable to cope with the situation, did we not all know that the real power behind the throne sits at the Secretary's table. Under the guidance of his watchful eye and experienced hand, there is no danger of the ship going upon the rocks.

Having said these things, is there any need that I pledge you my best endeavor for the coming year? You know that I will spend myself to the uttermost; especially in view of the fact that our next meeting will be held in the best State of the Union, my own, my native State. The State where the old grow young, and the weak grow strong, the Old North State. (Loud applause.)

Dr. Thomas S. Cullen moved that the thanks of the Association be extended to the President and Secretary for the admirable program given this year.

Motion seconded and carried.

Dr. R. S. Cathcart presented the report of the Auditing Committee, as follows:

We, the Auditing Committee, have examined the books of the Secretary and Treasurer and have found them correct, with a certified check for $1997.50 from the Secretary to the Treasurer, $37.00 being the interest on bank deposits.

(Signed) R. S. Cathcart,
George A. Hendon,
Hubert A. Royster.

On motion, the report of the Auditing Committee was adopted.

31. "Congenital Tumors of the Neck with Report of Cases," by Dr. C. E. Caldwell, Cincinnati, Ohio.

Discussed by Drs. Mixter, Scott, Blair, and in closing, by the author of the paper.

32. "Illustrated Paper on Ankylosis of the Jaw," by Dr. V. P. Blair, St. Louis, Missouri.

33. "The Significance of Pain in the Right Iliac Fossa in Young Women," by Dr. R. Winslow, Baltimore, Maryland.

Discussed by Drs. Rodman, Royster, Kirchner, Reder, Malone, Westmoreland, Smythe, and discussion closed by the essayist.

34. "Removal of Varicose Veins with Special Instrument," by Dr. Mack Rogers, Birmingham, Alabama.

35. "Acute Postoperative Dilatation of the Stomach," by Dr. E. P. Hogan, Birmingham, Alabama.

Discussed by Dr. Hendon, and in closing, by the essayist.

36. "Intestinal Resection: (*a*) Removal and Short Circuiting of More than Twelve Feet of Bowel; (*b*) Resection without Anesthesia," by Dr. Raymond C. Turck, Jacksonville, Florida.

37. "Catgut as a Skin Suture," by Dr. William P. Nicolson, Atlanta, Georgia.

Discussed by Drs. Horsley, Scott, Reder, and in closing, by the author of the paper.

Dr. J. Shelton Horsley.—It seems to me, this is one of the most successful sessions the Southern Surgical and Gynecological Association has ever held and no small part of that success is due to the Local Committee of Arrangements, and particularly to Dr. McRae, as Chairman. Therefore, I move that a vote of thanks be extended to the Local Committee of Arrangements for courtesies extended and to the manager of this Hotel, Mr. Keen, for excellent accommodations afforded us. The entertainment given us by the Local Committee was the most elaborate we have ever had.

Motion seconded and carried.

It was moved that a vote of thanks be extended to the retiring President, Dr. Brown, for the able manner in which he had presided over the deliberations of the Association.

Motion seconded and carried.

Dr. F. W. McRae.—On behalf of the Local Committee of Arrangements I desire to say that it has been a source of great

pleasure to have you with us, and we are delighted that you have enjoyed what we have prepared for you. (Applause.)

A paper by Dr. Alexius McGlannan, Baltimore, "The Conservative Treatment of Undescended Testicle," was read by title.

On motion of Dr. John D. S. Davis, the Association then adjourned to meet in Asheville, North Carolina, in December, 1914.

W. D. Haggard,
Secretary.

ADDRESS OF THE PRESIDENT

DIAGNOSIS AND SURGICAL TECHNIQUE TO BE EMPLOYED IN THE HANDLING OF ACUTE ABDOMINAL CONDITIONS

ILLUSTRATING MANY INTERESTING POINTS IN DIAGNOSIS AND TECHNIQUE, WITH ORIGINAL DRAWINGS

By John Young Brown, M.D.
St. Louis, Missouri

I would indeed be lacking in gratitude if I failed to express to the Fellows of the Southern Surgical and Gynecological Association my deep appreciation of the great honor conferred upon me in electing me to the highest office within your gift. Until quite recently it was my intention to follow the usual custom on such occasions and to deliver to you a general address, but after reading and re-reading the masterful oration of my distinguished predecessor, Dr. J. M. T. Finney, delivered at the last meeting of this Association, and hearing his equally scholarly address at the recent meeting of the American College of Surgeons in Chicago, it seems to me that the subject matter usually covered in such addresses has been exhausted, at least for a time.

I therefore trust that you will pardon me if I depart from the usual rule and present to you a subject of my own selection, namely, "The Diagnosis and Surgical Technique to

be Employed in the Handling of Acute Abdominal Conditions, Illustrating Many Interesting points in Diagnosis and Technique, with Original Drawings." Under this head, I shall consider:

1. Gunshot and stab wounds of the abdomen.

2. Injuries to abdominal viscera, resulting from severe abdominal contusions.

3. Acute intestinal obstruction.

I have selected the above-mentioned subjects for the reason that they constitute a distinct group of acute abdominal conditions where immediate operative treatment is mandatory, the mortality depending upon the time of operation and the technique employed.

With the exception of the last subject, acute intestinal obstruction, few individual operators have had the opportunity to draw conclusions from a large series of cases to be treated under the first two headings, namely, gunshot and stab wounds of the abdomen and severe abdominal contusions. I therefore will present in detail certain points in the diagnosis and technique of this work which I have found of value in the handling of a large number of such injuries. I shall then take up some important technical methods which I have found of value in dealing with the equally serious pathology, resulting from acute intestinal obstruction.

Gunshot and Stab Wounds of the Abdomen. Classification: Gunshot and stab wounds of the abdomen may be classified under three heads:

1. The simple penetrating wound, or a wound where the knife or bullet penetrates the peritoneal cavity without injury to abdominal viscera.

2. Penetrating and perforating wounds, or wounds where the knife or bullet penetrates the peritoneal cavity and injures either solid or hollow viscera, or both.

3. Complicated wounds, or wounds in which the entrance to the abdominal cavity is made by knife or bullet through

chest, pleura and diaphragm with or without injury to abdominal viscera.

Diagnosis. It is at times exceedingly difficult to differentiate between the simple penetrating wound and the penetrating and perforating wound. I have time and again operated on a patient whose abdomen has been penetrated by a bullet with both a wound on entrance and exit where no damage to peritoneal viscera was found, when the abdomen was opened and careful search for perforations was made. Such wounds give few or no symptoms. Again, I have operated on many cases in which there were present no symptoms indicating the serious nature of the injury, for the reason that the patient was not bleeding, as the perforations were in the "bloodless" portion of the bowel.

Fig. 1 will illustrate the difficulties encountered in differentiating between the two types of wounds. The simple perforating wound is the type of wound that the military surgeon often reports as recovering from undoubted multiple bowel injuries without operation. The civil surgeon recognizes that there is no method of telling whether injury to hollow viscera has occurred unless perforations are demonstrated by means of an abdominal section and careful search. I, therefore, seriously question the diagnosis in the reported recoveries from such injuries under the expectant plan of treatment.

In the penetrating and perforating wounds, giving no alarming symptoms, delay in exploring is the usual rule and when the exploration is at last made, the patient is found to be suffering from a lethal peritonitis. In contradistinction to the symptoms occurring in the above-mentioned cases we have another type of penetrating and perforating wound, giving immediate and alarming symptoms. In these cases multiple perforations of the mesentery are present and profuse bleeding occurs at once, bringing about profound symptoms of shock. Such cases demand immediate operative treatment.

In the penetrating and perforating wounds with multiple

injuries to liver, spleen, hollow viscera, and mesenteric vessels the diagnosis, of course, is simple.

Complicated wounds resulting from both knife or bullet are wounds in which the peritoneal cavity is penetrated by the entrance of the bullet or knife through the chest, the abdomen being opened through the diaphragm. While the majority of wounds of this type are readily recognized, I have seen quite a number of such injuries in which the diagnosis was difficult. In all stab and gunshot wounds, where the bullet or knife enters as low as the sixth interspace, irrespective of symptoms, injury to the diaphragm should be suspected and such wounds should be explored. The exploration should be made preferably through the abdomen. Should exploration be made through the chest and an injury to the diaphragm be found it would be impossible to tell without opening the abdomen whether or not fatal perforations of hollow viscera existed unless there is present severe shock indicating hemorrhage. The abdominal route is therefore, the method of choice, as it will enable the operator to view the damage and apply at once proper methods of repair, to both abdominal viscera and diaphragm. This is the only certain method of making a correct diagnosis in cases of this character.

Before taking up the technique to be employed in the handling of these cases I shall call your attention to several figures illustrating the various types of wounds coming under the classification above outlined. Fig. 2, which I now present, illustrates a type of penetrating and perforating wound. You will note that the bullet entered the peritoneal cavity at the lower border of the ribs on the right side, penetrating liver, gall-bladder, and stomach, the wound of exit being at the outer border of the left rectus muscle. This patient was operated on one hour after he was shot, and his recovery was uneventful.

Fig. 3 shows a complicated stab wound of the chest and abdomen, in which you will see the spleen, small intestine,

omentum, stomach, and colon prolapsed through the diaphragm into the pleura. There were multiple visceral injuries in this case, but the patient recovered following a combined operation.

TREATMENT. There is but one treatment of such injuries, and that can only be accomplished by means of immediate abdominal section and careful repair of all damage to viscera.

The surgical treatment of gunshot and stab wounds of the abdomen may be considered under four heads:

1. Preparation and examination of patient.
2. Method of locating injuries to peritoneal viscera.
3. Repair of such injuries.
4. After-treatment.

1. *Preparation and Examination of Patient.* As many of these cases are received profoundly intoxicated it is advisable, unless the patient has vomited blood, to wash out the stomach before the anesthetic is given; the removal of the stomach contents will greatly aid both anesthetist and operator. The abdomen should be prepared in the usual way and the wound of entrance should be carefully explored. No information whatever can be gotten by the use of the probe.

Fig. 4 shows the proper method of incising the wound of entrance and tracing the wound into the peritoneal cavity with the sterile finger. On the left hand side of this illustration you will note a classical stab wound of the abdomen, showing the prolapsed small bowel and the omentum protruding from the wound. Before returning prolapsed bowel and omentum it should be carefully cleansed with normal saline. Occasionally you will find a loop of strangulated bowel in the stab wound. The strangulation is readily relieved by enlarging the wound.

The patient having been prepared the abdomen is opened through a median incision, beginning an inch below the ensiform cartilage and extending an inch below the umbilicus. This incision gives free access to the abdominal viscera and can be lengthened in either direction if conditions demand.

2. *Method of Locating Injury.* There is nothing of more importance in dealing with injuries of this type than a thorough examination of the entire peritoneal contents. It is a well-known fact that unless a systematic search for visceral injuries be made, perforations will be overlooked and the overlooked perforation is, as a rule, the one responsible for the patient's death. It is, therefore, necessary that such a search be made in a manner that will enable the operator to handle the viscera as gently and rapidly as possible, without adding to the already existing shock. The method I have found most satisfactory, is as follows:

As soon as the abdomen is opened the liver and spleen are examined, and if hemorrhage from either organ exists it should be properly dealt with. If such hemorrhage can not be controlled through the median incision it is advisable to cut the rectus at right angles. This procedure, while by no means ideal, will enable the operator to quickly control the hemorrhage and produces less shock than would follow the forcible retraction of the median incision and the rough handling of the injured viscera. The anterior border of the stomach is now searched for perforations. If no perforations are found a rent is made in the gastrocolic omentum, opening into the lesser peritoneal cavity. Through this opening the posterior wall of the stomach is examined and any injury to the stomach or pancreas is noted.

Fig. 5 shows the technique. The wound in the omentum is at once closed in the manner shown in Fig. 6. The transverse colon is next examined and particular attention is paid to both the splenic and hepatic flexures, as wounds in this locality are frequently overlooked. Throwing back the transverse colon the small bowel will be seen to emerge through the transverse mesocolon as is shown in Fig. 7. Lifting up the small bowel at the angle of Tritz the operator examines it inch by inch, as the assistant returns it to the peritoneal cavity (Fig. 8). All perforations found are immediately repaired, and when the small bowel is traced to the

ileocecal valve the operator may feel confident that no perforations have been overlooked. The cecum, ascending and descending colon, and sigmoid are next examined, and if, in the judgment of the operator, it is necessary the patient is placed in the Trendelenburg posture, so that any wounds that may exist in rectum or bladder may be located and repaired. I have found this method of search simple and satisfactory. If the patient is profoundly shocked it is generally my custom to start irrigating the abdominal cavity with saline as soon as the peritoneum is incised. Fig. 9 will illustrate the method by which this is accomplished. You will note the stab wound above the pubis with the drain placed in the vesicorectal pouch and the saline flowing from the tube. This irrigation is not done for cleansing but for stimulation. It is astonishing how quickly a badly shocked patient will show signs of improvement as the hot saline is absorbed. I called attention to the value of this procedure in a paper read before the Mississippi Valley Medical Association on October 12, 1904. Dr. E. Wyllys Andrews, of Chicago, has since devised a special irrigating apparatus for this purpose.

In the repair of perforations of the bowel I have found that they can best be closed either by a purse-string suture or by a through and through stitch, supplemented by the Lembert stitch. Not infrequently, multiple perforations are found in close proximity necessitating bowel resection. Fig. 10 illustrates a rapid method of bowel resection in such cases. The bowel is folded on itself and the mesentery is clamped with a strong forcep and the segment of injured bowel is rapidly removed, and a cobbler's stitch is placed to control hemorrhage. The anastomosis can then be made with the Murphy button or suture (Fig. 11).

It is far better to resect in such cases than to repair with suture if there is the slightest question regarding the blood supply to the bowel.

Wounds of the Liver. Gunshot wounds of the liver are seen far more frequently than stab wounds. This is explained by the fact that the majority of people are right-handed; hence, with two individuals facing, the knife in the right hand would naturally strike the left side. Hemorrhage from liver wounds at times is profuse, but as the blood-pressure in the liver is the lowest in the body, such wounds have a tendency to cease bleeding without interference unless a large vessel is injured. I again wish to call your attention to Fig. 2, which illustrates a method used to control hemorrhage due to a gunshot wound of the liver in which the gall-bladder and stomach were also injured. You will note the catheter introduced through the wound of entrance and through the wound in the liver after the gall-bladder has been removed. You will also see the strip of gauze threaded through the loop in the catheter, ready to be drawn through the liver and the wound of entrance. This accomplishes the double purpose of hemostasis and drainage.

Fig. 12 shows a method of controlling hemorrhage from the liver by the use of gauze and suture in combination.

Fig. 13 shows a method of controlling wounds of the liver by the suture alone. In this connection let me say that no special needle is necessary for this work. If a large needle is threaded with No. 3 catgut, and we sew with the eye of the needle instead of the point, we get the same results—that would be gotten by the use of the many special needles that have been devised for this work.

Gunshot and Stab Wounds of the Spleen. Gunshot and stab wounds of the spleen are quite common, particularly the latter. It is important, if possible, to save the spleen. This can often be done by sutures and gauze. Fig. 14 illustrates a method of reinforcing the sutures by utilizing the omentum. My former associate, Dr. Kirchner, deserves the credit for devising this technique, which has been the means of saving the spleen in a number of cases without the use of which splenectomy would have been necessary. If

the rent or wound in the spleen is such that it cannot be repaired by suture and omental reinforcement the spleen should be removed. Fig. 15 shows the spleen delivered through the abdominal incision ready for removal. Fig. 16 shows the interlocking figure-of-eight sutures in place to control hemorrhage from the stump after removal of the spleen.

Injuries to the Diaphragm. The handling of complicated wounds is at times difficult, as the diaphragm is invariably injured. Prolapse of viscera into the chest is the rule, and we have to deal not only with the pleura and diaphragm, but with the abdominal contents as well. If a loop of bowel is prolapsed into the pleural cavity and the bowel is perforated the pleura is always infected. A wound of the diaphragm can frequently be repaired through the chest wound, and when the wound in the chest is sufficiently large to permit such repair it should be done (Fig. 16). As the abdomen must be opened in all such wounds the combined method is the method of choice. Fig. 17 illustrates the diaphragm being repaired through the abdominal incision. Note the forceps pulling the diaphragm down.

It is astonishing how slightly the patient is affected by a pneumothorax of one side. I have often viewed through a huge chest wound the lung partially functionating with the patient lying tranquilly on the table. After the diaphragm has been repaired, injuries to abdominal viscera should be searched for and properly handled. If there has been no contamination of the pleural cavity, the chest wound should be closed without drainage. If, however, infection of the pleura is suspected, drainage should be instituted.

It has been my invariable custom to drain all gunshot and stab cases where there was extensive soiling of the peritoneal cavity and where severe hemorrhage existed. The drainage is accomplished by means of a glass tube introduced through a stab wound above the pubis and placed at the

most dependent portion of the vesicorectal pouch, as illustrated by Fig. 19. In the lower left-hand corner you will see the improper method of placing the drain, the figure above showing the proper method.

Closing the Abdominal Wound. If the patient is badly shocked the wound should be closed with a through-and-through suture, as it can be more quickly applied than the layer suture. Although it would seem out of place to illustrate the technique of a through-and-through closure before so distinguished a body of surgeons, my observation has been that few operators make such a closure correctly. Fig. 20 illustrates the method taught by that great pioneer and master abdominal surgeon, the late Joseph Price. The closure is made with a long straight needle, the skin is retracted, and the needle is made to pierce the margin of the skin and body of the rectus muscle, catching the edge of the peritoneum. The needle next traverses the opposite side in the same manner. When the sutures are all placed the ends are bunched and the wound is elevated by traction. When the sutures are tied it will be seen that the peritoneum will approximate and perfect coaptation of like tissues from below up is accomplished. A beautiful coaptation of skin is gotten by using the "gliding approximation" taught us by the lamented Price. If the patient is not too badly shocked, the ordinary closure should be made.

Mortality. The mortality in gunshot and stab wounds of the abdomen is high, approximately 50 per cent. Dr. Kirchner and I are now at work carefully tabulating the large number of cases coming under our care during our service at the St. Louis City Hospital. We hope to publish shortly a complete analysis of the histories of all our cases. Granting a mortality of 50 per cent. following operative treatment of such injuries, I candidly believe that 100 per cent. mortality would result from the expectant plan of treatment in all cases where multiple bowel perforations existed.

As the after-treatment of gunshot and stab wounds is practically the same as that applied to the treatment of the conditions which are next to be considered, I will discuss it later.

Injuries to Abdominal Viscera Resulting from Severe Abdominal Contusions. Such injuries are, as a rule, the result of falls, kicks, or blows to the abdominal wall, automobile accidents, etc. The viscera usually involved are the liver, spleen, small bowel, mesentery, and bladder. In many of these cases, profound symptoms of shock immediately develop. In others the symptoms are slight. Careful examination of such patients will, as a rule, indicate that injury to viscera has occurred. Early exploration should be the rule in all such injuries. To show that severe damage to viscera can exist without producing alarming symptoms, I will briefly relate the case of a boy, aged seventeen years, who came under my care at the St. Louis City Hospital. While returning from swimming he fell heavily upon a large boulder, striking his left side. Although he suffered temporarily from shock he was able to walk to his home, a distance of eight blocks, one-half an hour after receiving the injury. Three days after the accident he was admitted to the hospital with a high temperature and rapid pulse, and on examination a large mass was found on the left side in the region of the spleen, extending well over to the midline. The expectant plan of treatment was applied in this case. Twenty-four hours after admission the capsule of the spleen ruptured, and although splenectomy was immediately done he died a few hours later as the result of hemorrhage and shock due to a large rent in the spleen.

Another most interesting case illustrated by Fig. 21 was admitted to the hospital with the following history: This patient, a telegraph operator by occupation, while intoxicated was struck by an automobile and rendered unconscious. Regaining consciousness he came to the hospital and was admitted as a "walker." Upon examination it was found

that he had sustained a fracture of the upper third of the right arm and abrasions and contusions on the legs and hips. At this time there was no evidence of the existence of internal injuries. When admitted to the hospital, at 3.50 A.M., his pulse was 100, respirations 24, and temperature 98.8°. On the following afternoon his pulse was 84, respirations 24, and temperature 101°. He complained of abdominal pain and was unable to urinate. The abdomen became distended and tympanitic. The recti muscles became rigid and there was dullness in both flanks. He complained of intestinal cramps and vomited fluid containing undigested food. His pulse was 118, respirations 24, and temperature 100°. A diagnosis of obstruction was made and the abdomen was immediately opened. The mesentery was found bruised in several places, and in one place there was a large rent extending from the root of the mesentery to the border of the intestine. A loop of small bowel was found prolapsed through the mesenteric rent and tightly constricted. The obstruction was reduced and the mesentery was repaired. No further injuries were found. The patient made a rapid recovery. The two cases above reported illustrate the fact that severe and fatal injuries of this type may exist with practically no symptoms. In contradistinction to the symptoms found in the two cases above reported, Fig. 22 shows a severe injury to mesentery and jejunum. This patient, a well-nourished male, aged twenty-nine years, was admitted to the hospital twenty minutes after having been run over by a wagon. He gave evidence of profuse hemorrhage and was badly shocked. The abdomen was immediately opened and the injury to the jujunum and mesentery as here shown was found. The mesentery was repaired, resection of the bowel was made, and an end-to-end anastomosis was done with the Murphy button. The patient died twelve hours after operation of shock.

Rupture of the Urinary Bladder. Rupture of the urinary bladder almost invariably results from abdominal

contusions. Such ruptures may be extra or intraperitoneal. Uncomplicated injuries to the bladder of this type are readily recognized and respond quickly to early operation. The complicated types—namely, those in which there exists severe injury to pelvic bones and to abdominal viscera—give a high rate of mortality. Ten cases of rupture of the bladder have come under my observation. Three of these were extraperitoneal. All recovered following operation. Four were intraperitoneal ruptures with two recoveries. I may add here that one of these cases was operated on by me in 1888. Of the complicated cases—namely, those where intraperitoneal rupture of bladder exists, associated with severe crushing of pelvic bones—all died.

Acute Intestinal Obstruction. At the last meeting of this Association, Dr. Alexius McGlannan, of Baltimore, presented a splendid clinical study of 181 cases of acute intestinal obstructions. In this paper he clearly demonstrated the importance of the early recognition of this condition and its prompt relief by surgical measures. In a recent paper read before the American Association of Obstetricians and Gynecologists, Dr. Walter C. G. Kirchner reported a careful study of 70 cases of bowel obstruction occurring during his service and the service of the writer as the St. Louis City Hospital. From a study of these cases he arrived at practically the same conclusions as those of Dr. McGlannan. Both the studies of Kirchner and McGlannan show a high rate of mortality and that a large majority of such cases reach the operating table late. In the 70 cases reported by Kirchner, 47 were due to strangulated hernia. Of the 47, it was necessary to resect gangrenous bowel in 15, and in 2 enterostomy was done. The mortality was 28.8 per cent. Of the various obstructions not due to hernia, there were 23. One in which resection was necessary, and in 3 enterostomy was performed. Mortality was 52 per cent. In 10 cases of obstruction due to postoperative adhesions bowel resection was necessary in 1 and in 1 enterostomy was done.

The mortality was 50 per cent. Four cases of obstructions due to preoperative adhesions, in one of which enterostomy was done, resulted in a mortality of 50 per cent.

From the frightful mortality resulting from this condition we can reach but one conclusion—namely, that the general practitioner is badly in need of enlightenment on this subject. In our series of cases some rather unusual conditions were found. Fig. 20 illustrates the condition found in a case which I will briefly report. The patient, aged fifty-five years, was admitted to the hospital profoundly shocked and vomiting fecal matter. The abdomen was greatly distended. His pulse was 96, his temperature was subnormal. He was immediately taken to the operating-room, and on opening the abdomen a huge gall-stone was found blocking the ileum, eighteen inches above the ileocecal valve. One of the interesting features of this case was that the patient had a Meckel's diverticulum. This, however, had nothing to do with the obstruction. The gall-stone and diverticulum were both removed. The patient made an uninterrupted recovery.

Fig. 24 illustrates a most interesting case, that of a young man who came to the hospital with the history of eight days' illness. The boy was the son of a doctor, and his father stated that from early infancy he had suffered at frequent intervals from intestinal colic and vomiting, usually relieved by castor oil. On admission to the hospital his condition was critical. On opening the abdomen his appendix was found attached to a Meckel's diverticulum, and through the opening made by this attachment the small bowel had prolapsed twisting the pedicle of the Meckel's and bringing about an acute obstruction. The diverticulum was gangrenous. The appendix and diverticulum were quickly removed, thus relieving the strangulation, and the boy made a nice recovery. Fig. 25 shows the gangrenous diverticulum and appendix.

Treatment. No hard-and-fast rules can be laid down relative to the treatment of acute obstruction. Too much

stress cannot be laid on the importance of preparing such cases for operation. As the majority of them come in profoundly toxic and vomiting fecal matter, stomach lavage should invariably be done before the anesthetic is given. The surgical technique should be carried out as rapidly as possible, consistent with thorough work. I cannot too strongly emphasize the importance of draining the bowel of its highly toxic contents in every case.

Fig. 26 shows a rapid method of accomplishing this drainage in cases requiring resection. You will note the tube in the proximal bowel. While the assistant is draining the distended gut above the constriction the operator is tying off the mesentery. It will be seen that by this method no time is lost, and when the resection has been accomplished and the distal end made ready for anastomosis the distended loop above has been drained of a large quantity of material which if left would greatly interfere with the patient's recovery. I reported this method in a paper read before the Mississippi Valley Medical Association in 1904. The paper was afterward published in the Journal.

In handling gangrenous bowel found in the sac of a strangulated hernia I have found the method which I will now describe of great value in making an artificial anus. Fig. 27 shows the sac opened and the loop of gangrenous bowel delivered. The constriction having been relieved a wide resection well back into healthy bowel is done in the following manner: A heavy clamp is made to perforate the mesentery on either side at its intestinal margin and is then closed tightly, thus controlling the hemorrhage. Two clamps are then placed in order to prevent the healthy bowel from receding into the peritoneal cavity and two other clamps are placed to prevent leakage from the bowel to be removed. When these clamps are placed the gangrenous gut is quickly cut away. Fig. 28 shows the two ends of bowel fixed in the hernial opening, the clamp on the mesentery filling the double purpose of controlling the mesenteric hemorrhage, and hold-

ing the two ends of bowel in position. In the left-hand corner of Fig. 28 will be seen a rubber tube into which one-half of a Murphy button has been inserted. A tube of this type is then introduced into the lumen of both bowels and retained there by means of a purse-string suture.

Occasionally we find a knuckle of small bowel tightly constricted and gangrenous in the sac of a femoral hernia. In all such cases, where it would be unsafe to return the bowel to the peritoneal cavity, and resection has to be done, it has been my practice to make a supplementary abdominal incision, relieving the constriction, pulling the bowel through the abdominal wound, and resecting in the manner described above (Fig. 29). This method makes resection much safer than by operating at the hernial site. When resection is done at the hernial ring there is always danger of interfering with the approximation, whether made with the button or suture, returning the bowel to the peritoneal cavity.

After-treatment. The after-treatment of all of the types of cases above considered should be as simple as possible. It is our custom unless there are special contra-indications to allow such patients to have all the water they desire. Strychnine is never used and morphine is rarely needed.

Proctoclysis, tap water being used by the Murphy method, I have found of value. The Fowler position I have practically abandoned as a method of treatment, not only in the types of injuries above discussed, but in my other acute work.

In conclusion, I wish to thank the Fellows of the Association for their patience in listening to the lengthy presentation of this subject.

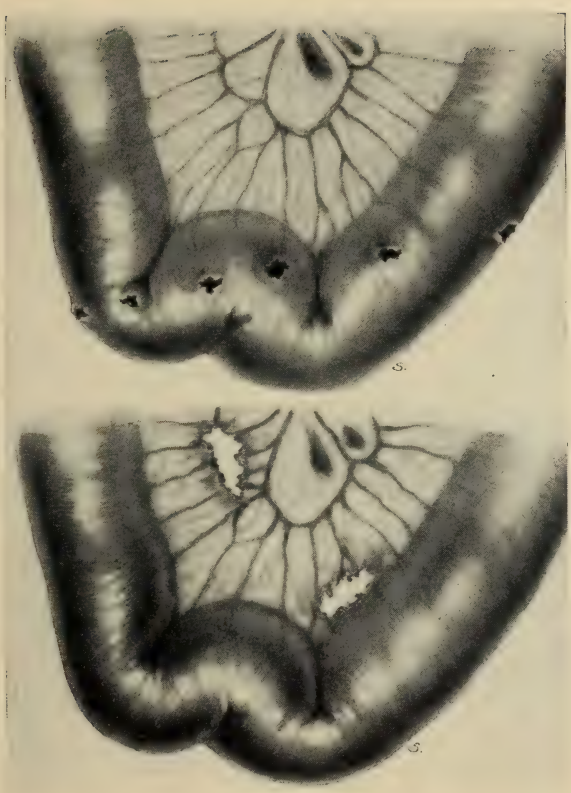


FIG. 1.—A, multiple gunshot wounds of the small bowel. Patient suffering a fatal injury with no immediate symptoms indicating the seriousness of the injury. B, multiple gunshot wounds of mesentery. Patient suffering fatal injury with immediate symptoms of hemorrhage and shock.

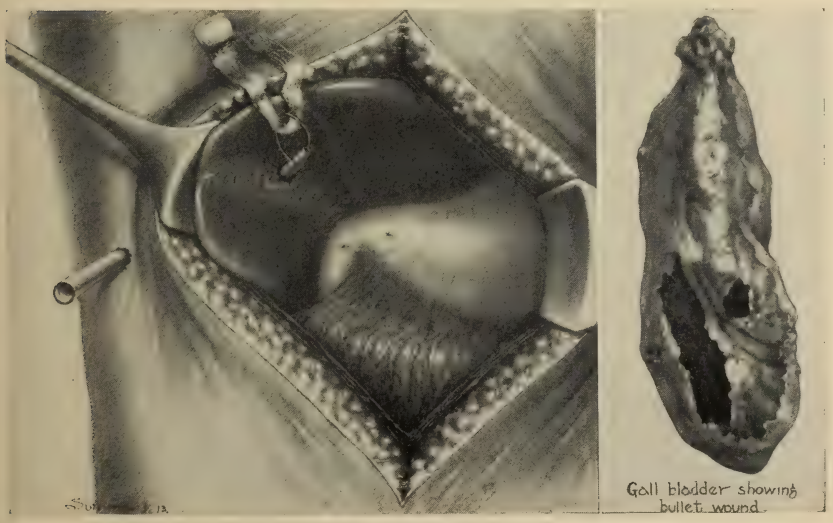


FIG. 2.

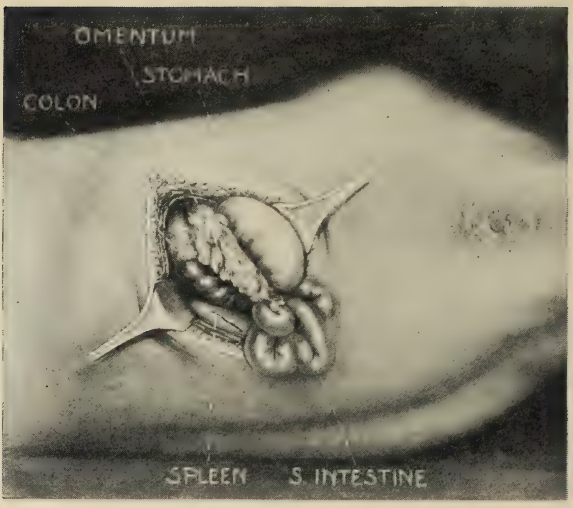


Fig. 3.

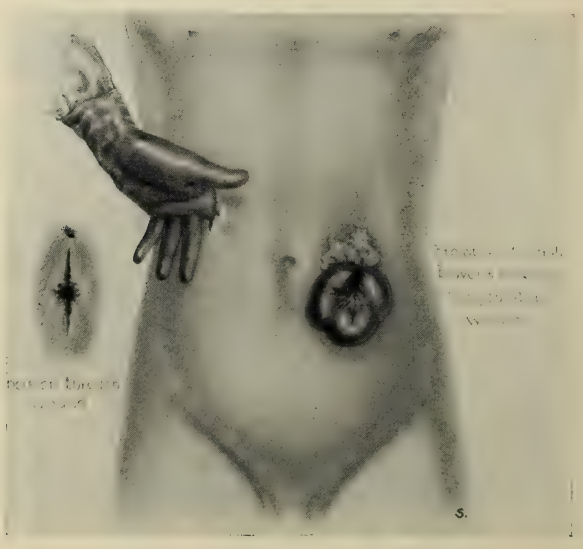
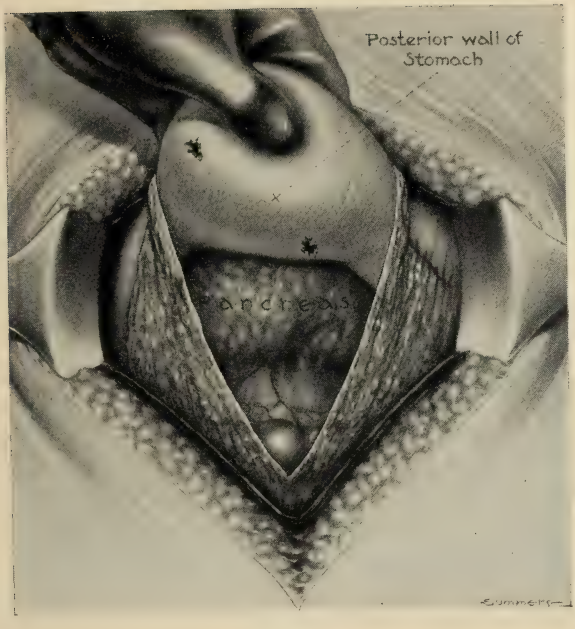


Fig. 4.



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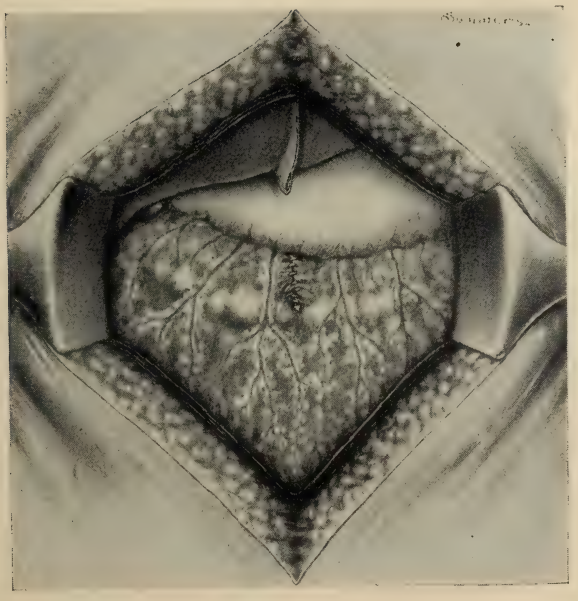
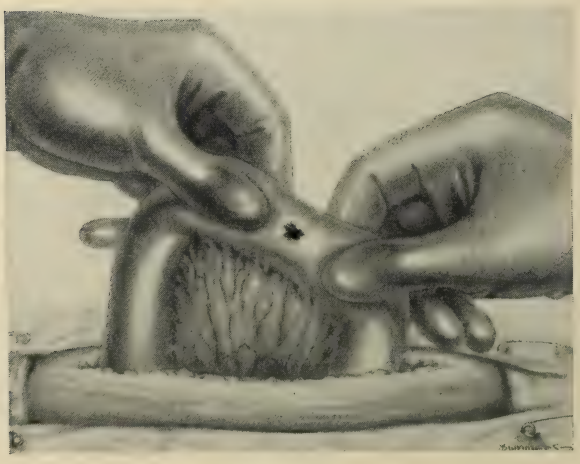


FIG. 6.

Fig. 7.



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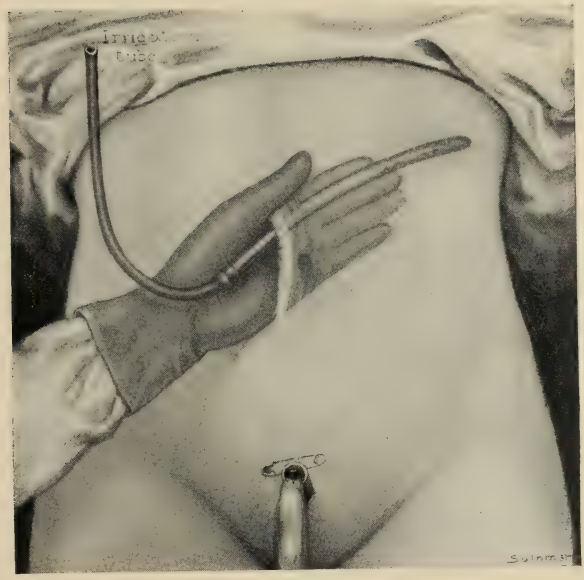

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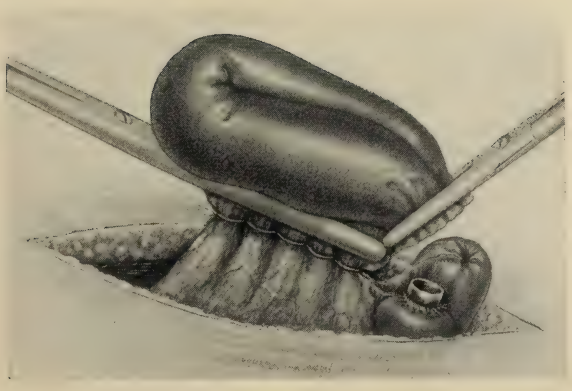
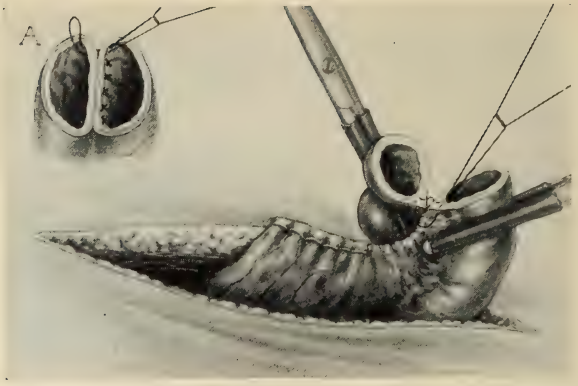


FIG. 10.



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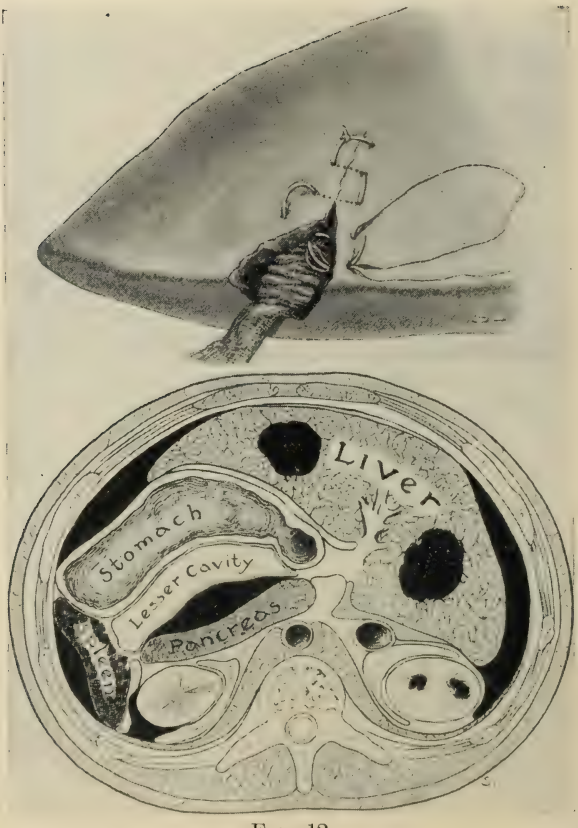

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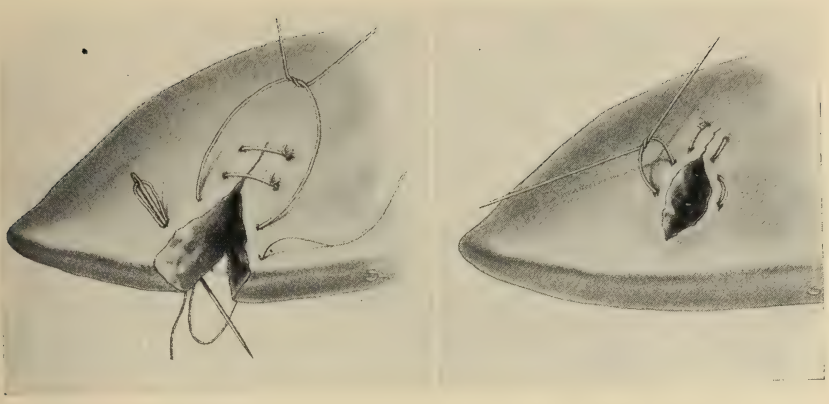

Fig. 13.

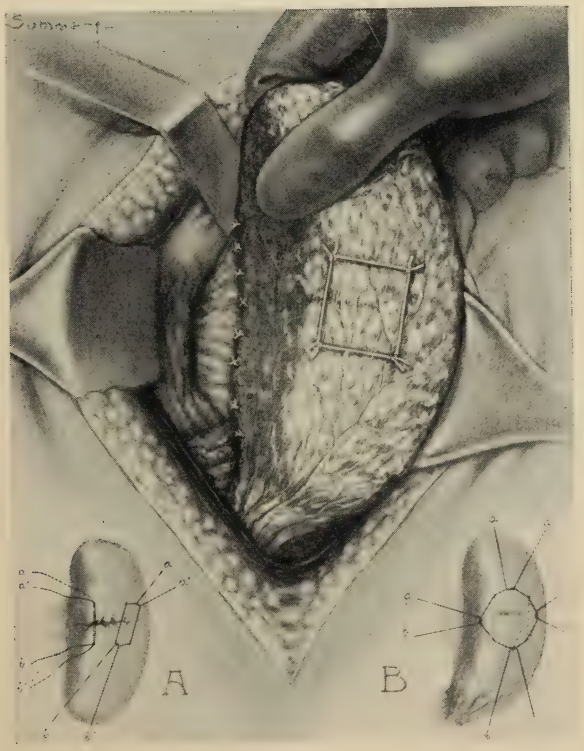

Fig. 14.

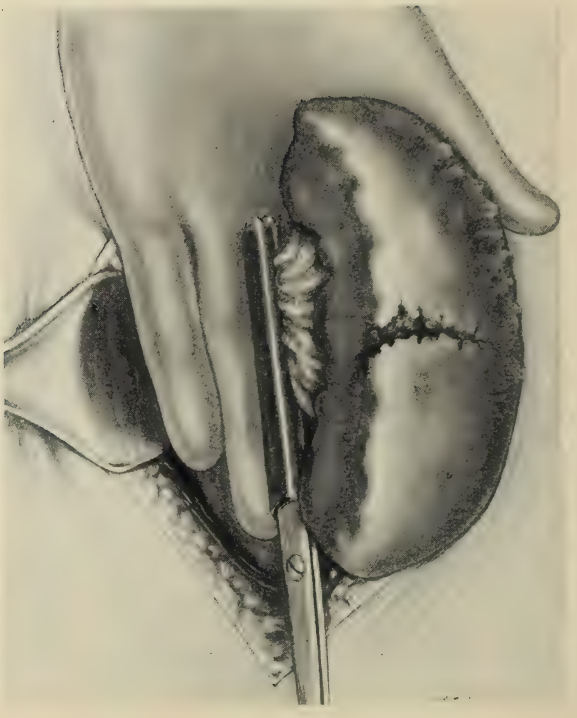

Fig. 15.

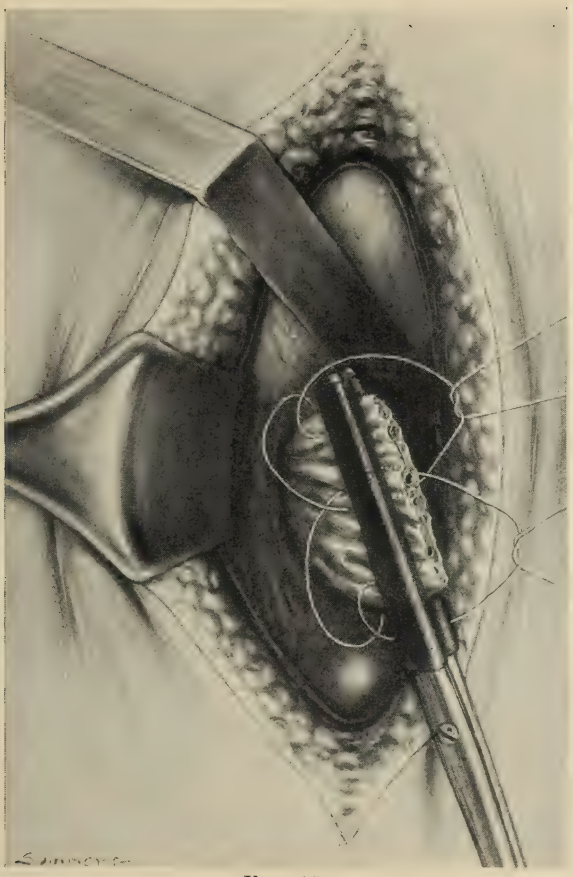

FIG. 16.

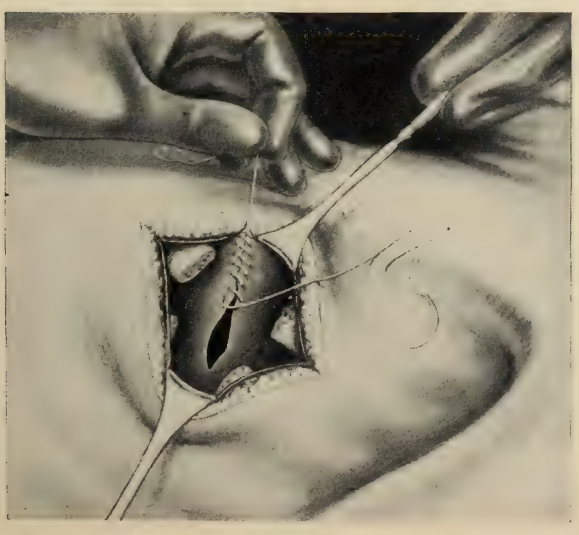

FIG. 17.

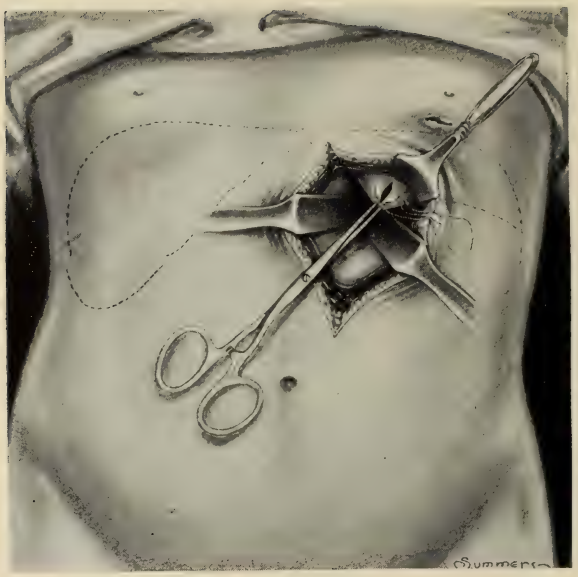

FIG. 18.

FIG. 19.

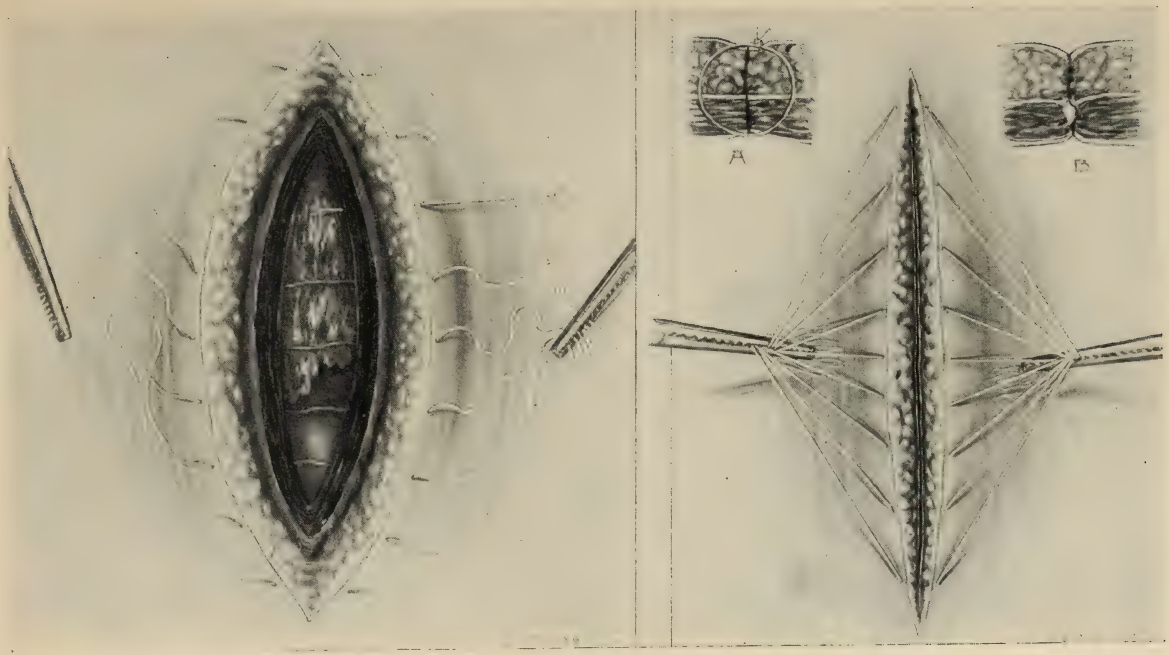

Fig. 20.

Fig. 21.

Fig. 22.

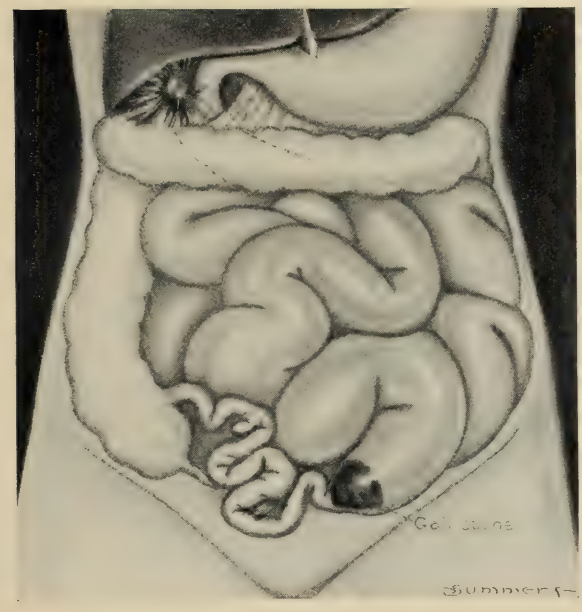

FIG. 23.

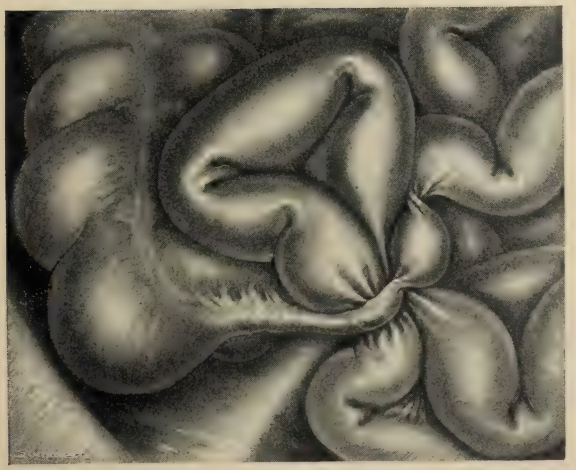

FIG. 24.—Showing appendix attached to Meckel's diverticulum, small bowel imprisoned under loop, twisting pedicle of diverticulum, which was found to be gangrenous at operation.

FIG. 25.

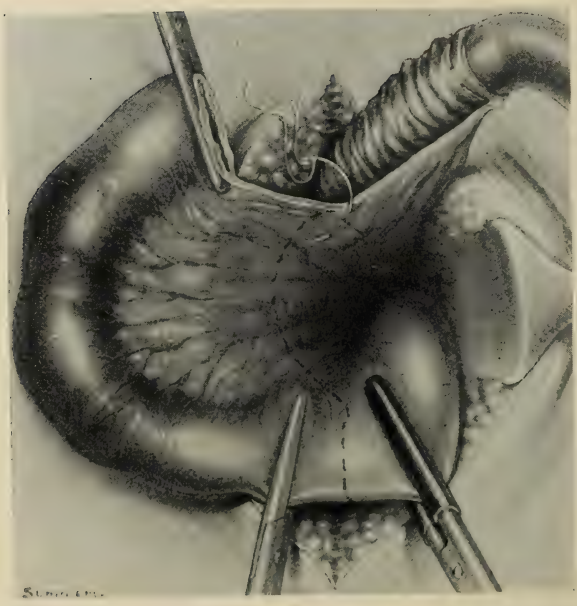

FIG. 26.—Method of draining distended loop above block.

Fig. 27.

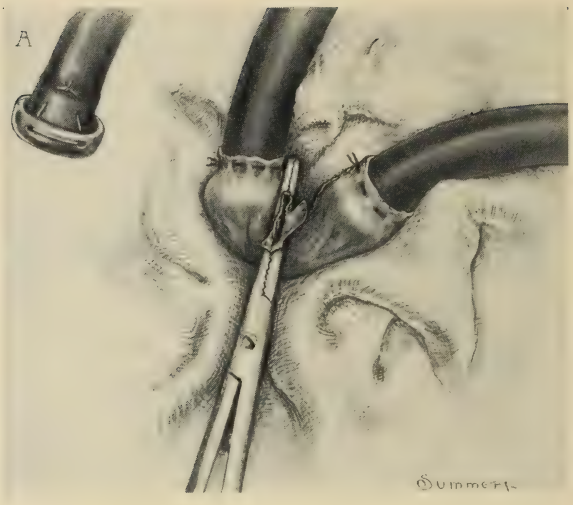

FIG. 28.

FIG. 29.

SUCCESSFUL SUTURE OF STAB WOUND IN RIGHT VENTRICLE OF HEART

By Joseph A. Danna, M.D.
New Orleans, Louisiana

From a dramatic and sensational view-point, nothing can be more interesting or exciting than the subject of operative procedures on the heart itself.

From a practical standpoint the surgery of the heart is limited to a few hundred cases in the experience of a limited number of men. This is due partly to the fact that wounds of the heart are, as a rule, quickly fatal, and the patient dies immediately or soon after infliction of the wound, and partly because surgical procedures on the heart are not readily undertaken except by men of larger experiences, who, as a rule, are not immediately attached to or immediately available in emergency hospitals or the accident departments of general hospitals, and these patients are usually seen only by younger and less experienced members of the hospital staff.

Those who might be desirous of going fully into this subject in all its phases are referred to that most exhaustive, comprehensive and interesting chapter on wounds of the heart in the section on the surgery of the vascular system, which occupies a considerable part of Volume V of Keen's *Surgery*, written by him of whom we of New Orleans are so justly proud, Dr. Rudolph Matas.

The purpose of this paper is merely to report a case which I had the good fortune recently to observe and operate upon,

describing the case as it presented itself, and my observations and conclusions as I went along.

Elijah Lee, a healthy, robust, well-developed negro, aged thirty years, was brought into the accident room of the Charity Hospital in an ambulance twenty minutes after receiving a stab wound in the third intercostal space, one inch to the left of the sternal border. The weapon used was the three-inch blade of a pocket-knife in the hands of his jealous wife (?). He had lost consciousness immediately after being wounded, and had bled profusely. He was profoundly shocked, covered with a copious cold perspiration, his pulse was barely perceptible, rapid, and impossible to count. He was restless and anxious, and complained of an oppression in the precordial region.

I immediately decided that he was bleeding to death either from a wound of the internal mammary, for which I thought something might be done, or possibly from a wound of the pericardium or heart itself, in which case I felt that the case was hopeless. He was hurriedly carried into the amphitheatre, the anterior chest wall was dried and freely wiped with benzine, and painted with the usual solution of iodine. After infiltration of the skin with a No. 1 Schleich solution the incision was prolonged upward and downward in a curved manner, so as to freely expose the third and fourth intercostal spaces. The muscles were scraped from their attachments to the sternum and third, fourth, and fifth ribs with a scalpel. The fourth costal cartilage was found completely cut in two near its attachment to the rib, was stripped of soft parts attached to it, and broken off at its sternal attachment. There was now a profuse gush of blood, which was stopped with finger pressure in the centre of the wound, and the upper end of the cut internal mammary artery was found and caught with forceps. On removal of the finger there was again profuse bleeding.

The lower end of the internal mammary not being easily found, with the finger still in the bottom of the wound, the

cartilage of the fifth rib was removed by being stripped of soft parts and cut from its sternal and costal attachments.

The soft parts constituting the lower edge of the wound were now caught with a number of forceps to insure clamping the lower end of the vessel, and the finger again removed, when the blood again flowed freely from the depths of the wound. It was plain, therefore, that something else besides the internal mammary was bleeding. With more careful and deeper palpation with the finger a small slit about one-quarter inch long was felt in what felt like and afterward proved to be pericardium, and finger pressure on this opening completely controlled any further hemorrhage.

I now realized that I had to deal with a wound of the pericardium and possibly also of the heart itself. To get a better exposure, therefore, I removed the cartilage of the third rib as I had done the fourth and fifth. In doing this the left pleura was opened slightly and some air aspirated. This was remedied temporarily by plugging the opening with a wet sponge until it could be sutured later. Without any definite plan in mind, I now caught the edge of wounded pericardium with an artery forceps, and with a Mayo scissors enlarged the opening sufficiently to freely admit my index finger. All this occupied less time than it takes to tell it. During all this time I felt that I was dealing with a man who was nearly dead when I started. So that when with blood pouring freely from the wound I inserted a finger within the pericardium, felt the heart as a hard, round, smooth body for a second and then felt it relax completely, I felt that it had beat for the last time. But presently it again became contracted and plainly felt, but it immediately relaxed again and I felt sure now that all was over. While wondering if it would not possibly beat again, the fact dawned upon me that it was the correct thing for the heart to alternately contract and relax, and I was now informed by one of those present that the pulse had suddenly improved in

character and was now beating strongly and slowly. This sudden improvement probably resulted partly from stimulation of the heart by contact with the finger, and partly from the setting free of the blood which had been poured into the pericardium, and which was causing the heart to be squeezed, as it were, by the constantly increasing intrapericardial pressure.

The fear of imminent death now dispelled, I caught each edge of the incised pericardium with forceps and slit it freely up and down, quickly sponged the cavity with a number of loose sponges, and got a perfect exposure of the entire anterior and left lateral aspects of the heart, and for a moment it looked as though there was no wound of the heart itself, for the smooth, glistening surface seemed unbroken. More perfect sponging, however, revealed a spurt of dark blood with each sytolic contraction of the heart, and a more careful examination showed a wound one-quarter inch in length on the anterior aspect of the heart, about one-half inch from the auriculoventricular groove, running obliquely downward and to the right, from which the spurting came.

A round full-curved Emmett's intestinal needle threaded with No. 2 catgut prepared by the iodine method of Bartlett was now harpooned, as it were (owing to the free motion of the heart), into the ventricle, about one-quarter inch above the incision, and allowed to enter the ventricular cavity, taking a good bite of the ventricular wall and coming out at a corresponding point on the opposite side of the wound. This suture, when tied, controlled the bleeding to a great extent, but not entirely, It also served to steady the heart and made the insertion of the other three sutures easy. Each suture was tied rather tightly and firmly with the double purpose of insuring against leakage, and in addition insuring the burial of the suture material on the inside of the ventricle and its absorption, thus avoiding the possibility of an unabsorbed piece of catgut being thrown into the circulation. I was afraid to risk inserting the sutures only

to and not including the endocardium, for fear that I could not thereby get a sufficiently thick bite of the ventricular wall to insure against leakage. For the same reason four sutures were used where three would probably have been sufficient. The cavity was now thoroughly dried by loose sponging and the pericardium and pleura sutured.

The patient was now thoroughly conscious and comfortable, and chatted with those about him, the only time he complained being while the second suture was being tied, when he said he had a pain in his heart. Preparations had been made to infuse him, but it all happened so quickly that the cardiac wound had been reached and his general condition improved before the infusion could be started, and then it was thought inadvisable, because of the probability of its increasing the intracardiac pressure, stimulating the heart to more vigorous contraction and endangering the safety of the sutures.

A cigarette drain was inserted down to the pericardial suture line, and after approximating the soft parts as well as possible with another catgut suture, the skin was sutured with silkworm-gut.

On February 1, the seventh day after the operation, the skin sutures were removed and the drain replaced by a small gauze wick, which was left in for another week. The wound healed in due course of time. Antitetanic serum, 15 c.c., was administered subcutaneously February 28.

His pulse, on being put to bed immediately after leaving the operating-room at 1.30 P.M., was 60, respiration 14. He was well covered and warmed, and given morphine by needle in one-quarter grain doses as often as it was deemed necessary for the purpose of keeping him quiet and relieving pain. He was cautioned not to move or stir, and was in this respect a very good patient.

The pulse and temperature began to rise a few hours after operation. At 9 P.M. the pulse was 88, respiration 30, temperature 101°. For the next five days, the temperature

ranged between 100° and 102.6°, and pulse 110 to 132. This was probably the febrile reaction following the loss of so much blood. On January 31, six days after operation, the temperature was normal and pulse 90 to 100. Two days later the temperature again began to rise, and a few days later he developed a cough and had signs of scattered areas of bronchopneumonia in both lungs. A few times his sputum was bloody. There had always been slight dulness on the left side, which was attributed to aspiration of blood into the pleura during operation.

February 7, the temperature reached maximum of 103°, the left pleura was aspirated and seven ounces of bloody serum withdrawn. Convalescence was uninterrupted after this, though his temperature did not permanently reach normal until February 16. He was kept in bed until March 19, and left the hospital on March 30.

He is now well and working as a laborer in N. O. & N. E. R. R. yards.

Conclusion. To summarize the notable points in connection with this case: 1. The whole procedure was very easy and could have been done by any one possessing the average surgical ability.

2. The removal of the third, fourth, and fifth costal cartilages and free incision of pericardium exposed the heart to the full view of the operator and all who were looking on.

3. Manipulation of the heart was not attended with either shock or pain; the patient talked and felt comfortable during the process of suturing, sponging, etc.

4. The heart moves very freely, but can be steadied by forceps or sutures without harm.

5. The heart alternately contracts and relaxes, and during the state of relaxation it feels soft as jelly.

6. Much of the shock in this case was due to effusion of blood into the pericardium and "squeezing" of the heart to the extent of materially interfering with its dilatation and proper functioning.

7. The placing of the sutures through and through did no harm in this case, though the authorities advise not letting the sutures penetrate the endocardium.

8. The pericardium was not drained, though this is also advised.

9. The pleura was opened in getting the proper exposure, an accident which usually happens in these cases, but which I believe might have been avoided with care.

10. Every case of wound of the chest with signs of severe hemorrhage, where the bleeding is believed to be the result of injury to the intercostals, internal mammary, or the heart or its coverings, should be operated on. And no case should be considered too far gone for operation. If this is done a life will occasionally be saved and more reports of suture of the heart wounds will find their way into the medical literature.

DIRECT SUTURE OF THE BRACHIAL ARTERY FOR TRAUMATISM; RESTORATION OF CIRCULATION; SUBSEQUENT DEVELOPMENT OF ISCHEMIC PARALYSIS

By J. Garland Sherrill, A.M., M.D., F.A.C.S.
Louisville, Kentucky

This report is presented with the hope that in view of the recent work in the line of vascular surgery a study of the results of operations of this nature may prove interesting and also valuable, especially with reference to the subsequent history of these cases.

In the fall of 1912 the following case came under observation: The patient, a young man, aged twenty-three years, who works in a laundry, in removing some material from a centrifugal machine, had his arm caught and twisted in such a way that a backward dislocation resulted at the elbow. When first seen by the writer about an hour later he was complaining greatly of pain; there was marked swelling in the forearm, which was purple in color, and also an entire absence of radial pulsation, but there were no symptoms of false aneurysm present. Both bones of the forearm were dislocated backward at the elbow, but the skin of the arm was unbroken. It was at once suspected that the brachial artery had been severed; his arm was at first immersed in hot water for some time to determine whether or not the circulation could be restored. At the end of three hours, there being no improvement and a marked increase in the

pain, swelling and discoloration, an incision was made down to the brachial at the bend of the elbow. The humerus, which was lying in front of the coronoid process of the ulna, was restored to its position; the ends of the brachial artery stood forth prominently in the wound, both being filled with blood-clot, no fresh blood being present. A small amount of clot was found among the torn muscles.

It seemed to the writer that with the bloodvessel occluded a noticeable collateral circulation should have formed by this time, if such result were likely to obtain. Therefore it was concluded that a direct suture of the torn ends of the artery offered to the patient the best possible chance of saving his arm. The clots were removed from both the distal and proximal ends of the vessel, and a Crile clamp then placed upon each to control bleeding during the steps of the operation. It is likely that the clamp on the lower end was not necessary, as that vessel did not bleed when the clot was removed, but its use facilitated considerably the manipulation of the torn vessel. The sheath of the artery was torn away from the distal portion, and had contracted somewhat over the proximal end. This was held out of the way while the vessel itself was sutured. In making the anastomosis the method described by Carrel and employed by Crile was used. A very fine linen thread was separated into its three primary strands, one of which was carried through a very fine round needle (No. 16, Kirby), the thread being previously saturated with sterile vaselin. Three guy sutures were passed through the coats of the vessel; the lower suture was held by a forceps which was allowed to hang down, and the other two caught by forceps which were held by my assistant, thus giving a straight line for the suturing, which was done by continuous suture. The dragging of the forceps below prevented any possibility of catching the wall opposite the line of intended suture. The vessel was turned after each suture in such a way that each side of the triangle was completely closed. After this was accom-

plished the clamps were released and the blood was allowed to flow, a small amount escaping; an additional suture controlled the hemorrhage and the sheath was drawn down from the proximal side and united to that from which it had been torn below. Following this the clamps were again removed and the blood allowed to flow through the line of anastomosis, which it did without any escaping from the vessel.

The median nerve was exposed in the wound, but was apparently uninjured. The wound was closed without drainage and the arm put up in a voluminous dressing in a position of partial flexion. Within five minutes after the suturing of the vessel was completed the circulation had returned in the hand, although we were unable to certainly determine a pulse at the radial artery. Some time elapsed before a distinct pulse could be felt at the wrist; numbers of times I thought I detected it, but was afraid that the desire to feel pulsation was sufficient to make me believe it had been obtained. However, it was soon restored and is still easily felt. The patient made a somewhat protracted convalescence and was disturbed some by the numbness in the fingers, which was thought to have resulted from the stretching of the median nerve. In dressing the arm during his convalescence the greatest care was employed to prevent constriction of the circulation, therefore the dressings were voluminous and the bandages were loosely applied. Notwithstanding these measures were very carefully carried out, the final result has not been as satisfactory as had been hoped. There has been some slight impairment of motion at the elbow, which has shown improvement recently; also partial interference with pronation, and supination was observed. A contracture took place in the forearm and hand which was very like that resulting from an ulnar paralysis—flexion of the wrist, extension of the first phalanges of the fingers, with contraction of the second and third. During the early stages forcible correction of the deformity could be accom-

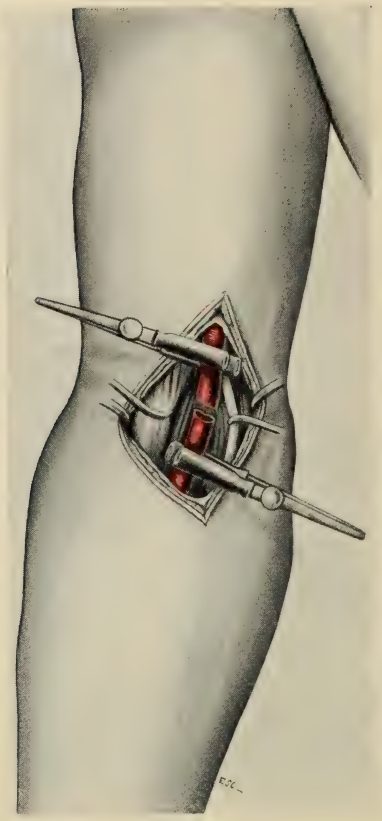

FIG. 1.—Exposure of wounded artery preliminary to suture.

FIG. 2.—Suture of artery. (After Carrel.)

plished, but always with considerable pain to the patient. Subsequently, however, the wrist became more firmly fixed; the tendons were contracted and attempts at restoration were ineffective. Massage was tried rather faithfully without great improvement. During this period there was a loss of sensation in the little and half of the ring fingers. Absence of heat sensation was also present, as shown by the fact that in using hot applications the patient's hand was burnt without his knowledge. All these symptoms seemed to point to a lesion of the ulnar nerve, therefore an incision was made down upon the ulnar nerve to correct the condition. It was found, however, that the ulnar nerve was normal so far as could be observed. At the same time correction of the stiffness at the wrist, as well as in the tendons of the fingers, was made, and those tendons which were most contracted were cut, allowing the arm to be placed in a normal position. Following recovery from this operation there was slight improvement in the sensation of the fingers and the deformity was considerably less, but still some contraction remains, as shown in the illustration, and there is some atrophy of the muscles, especially on the posterior surface of the hand.

The following report of the response to electric stimulation is given by Dr. John J. Moren:

On inspection I find the upper arm very much reduced inside, and the lower arm and hand shows marked muscular atrophy. The arm cannot be extended from the elbow, and there is limited pronation and supination. The metacarpophalangeal articulation is very free, but the second and third digital joints are practically fixed in a state of flexion. The lower arm feels firm, as if it were fibrous tissue instead of muscle. There is a distinct radial pulse, though weaker than on the opposite side. The only disturbance of sensation is found in the ulnar distribution of the hand. He has only a slight voluntary flexion and extension at the wrist, and a slight flexion and extension of the thumb and first three

fingers, the little finger cannot be moved at all. He is unable to separate any of the fingers.

The electrical test is as follows: All muscles, except the supinator longus, fail to respond to the faradic current; no response is obtained by direct stimulation of the nerves. The galvanic current, strength 10 to 15 milliamperes, will contract the common extensor to the middle finger. There is a slight flexor contraction, but I am unable to say which muscle. Direct stimulation of the musculospiral nerve causes no visible contraction, but the patient could feel a tingling and "pulling" in the arm and fingers. There was a more perceptible tingling and "pulling" feeling in the fingers on stimulating the median. No response whatever followed stimulation of the ulnar nerve.

The interpretation of the electrical findings is as follows:

1. Degeneration of the ulnar nerve.
2. Degeneration of the muscles of the forearm and hand.

It is possible, of course, that there was an injury of the musculospiral nerve at the time of the accident, but there was nothing to suggest it. The median nerve was exposed at the time of the first operation, and was found to be uninjured.

It seems somewhat difficult to explain all the phenomena occurring in the subsequent history of this case, and the question of whether or not this is a true ischemic condition is a debatable one. The assumption that the contracture is due to injury of the nerves cannot be clearly established. The amount of pulsation at the radial artery would seem to prelude the possibility of an ischemic condition. It is possible, of course, that the time which elapsed between the accident and the suture of the brachial artery, about four hours, during which the limb was entirely devoid of blood, was sufficient to produce a progressive atrophy of the muscles of the limb. The treatment which has been employed for the young man has been massage with alcohol and oil, the application of heat, passive motion, and the employment of

electric stimulation. All of these measures have been carried out in a more or less unsatisfactory manner, the patient not having given his attendant the proper aid in attempting to effect a recovery.

The restoration of the circulation by suture of the brachial artery in our opinion saved this boy's arm, and although the limb is imperfect as compared with normal function, still it will prove of great service to the patient. It seems reasonable to conclude that if left alone this arm would have been lost, and even if the brachial artery had been ligated in the usual manner it seemed to those present that gangrene would probably have resulted, because of the great swelling of the tissues and the time which had elapsed after the injury would likely have made the collateral circulation imperfect.

Ischemic atrophy and paralysis may occur as a result of arterial interruption, which must be nearly or quite complete, and usually of over two or three hours' duration; or from an interrupted venous return, the most frequent cause of which is perhaps tight bandaging when splints are applied to a limb. Similar result obtains from the prolonged use of the Esmarch's bandage. Direct injury to the vein, embolism, thrombosis, syphilitic endarteritis, the effects of cold, and Raynaud's disease have also been considered causative factors.

Oppenheim (vol. I, p. 411) says: "The investigations which Lapinsky carried out in my laboratory have indeed shown that, under the influence of arterial ischemia, it is mainly the nerves which suffer, and that this gives rise to a condition which is not quite that of so-called ischemic muscular paralysis, sensory disorders and atony being also present. Although these facts are important and deserving of consideration, yet the paralytic conditions produced by pressure of bandages corresponds so close to that described by Volkmann-Leser that they must have been produced by factors other than those employed in Lapinsky's experiments. In any case Lapinsky shows that ischemia of the

nerves is a factor not to be neglected in the paralysis caused by tight bandaging. Hildebrand has also recently noted this: he draws attention especially to the compression of the nerves by the rigid muscles, and considers this process from a therapeutic point of view. Riedinger also blames direct muscular compression. I have several times seen symptoms of traumatic neuritis accompanied by muscular changes which correspond to those of ischemic muscular paralysis, due to the fact that the corresponding artery was also injured and obliterated.

"It must not be forgotten, also, that the manifold mechanical conditions resulting from peripheral injuries (stiffness of joints, section and cicatricial adhesions of muscles, tendons etc.) may very materially add to the difficulties of diagnosing traumatic paralysis of the nerves."

Symptoms. The symptoms will vary with the severity of the interruption of circulation. The limb is often pale, sometimes cyanosed, and cold; electric irritability of muscle is lost after the condition has lasted five hours, according to Ferguson, and after seven hours painful rigidity and contraction begin. These contractures are sometimes severe and paroxysmal in character, usually disappearing in the course of a few days, and leaving the muscle flaccid. The muscles become tender on pressure. As the swelling disappears muscular atrophy becomes manifest, the muscles becoming hard and firm. The skin at this stage becomes glazed, pale, and cold; the limb becomes contracted, the hand being flexed at the wrist and the fingers usually at the metacarpal phalangeal joint. Sometimes, however, as in the writer's case, the first phalanges are extended and contraction takes place in the second and third. This peculiarity may occur as a result of atrophy of the ulnar nerve. Ferguson has given a very complete *resumé* of the pathological anatomy, which it would seem well to include here:

A. 1. Muscle is gray, dirty yellow color, dull in appearance, and friable.

2. Under the microscope, transverse and longitudinal structures more obvious.

3. Almost complete absence of muscular nuclei.

4. Usually no fatty degeneration.

B. 1. Muscle firm and tough; more or less normal in appearance.

2. Under the microscope, great increase of fibrous connective tissue between bundles of muscular tissue and between individual muscle, fibers, and cells.

3. Fibers have lost their polygonal form; are smaller and rounder, but maintain their striæ even under extreme atrophy.

Interrupted Venous Return. 1. Acute symptoms are those of thrombus, viz., swelling, cyanosis, edema; limb feels fuller, harder, and is tender on pressure.

2. Acute symptoms may pass off, but limb is left in condition of passive congestion, making limb larger—pseudo-hypertrophy.

Pathological Anatomy. 1. Early stage, increase of intermuscular fibrous connective tissue.

2. Later stage, connective tissue more abundant, some atrophy of muscles, fibers, and fatty degeneration.

Pressure Lesions of Nerves. 1. The resultant symptoms of severe cases of this are similar to nerve section, and are paralytic in nature, pain and hyperesthesia being usually absent.

2. Paralysis usually more marked than anesthsia.

3. Trophic changes are usually rare.

The changes occurring in different cases will of necessity vary, because of the fact that nourishment of certain tissues will be retained, while certain others will be entirely deprived of nutrient fluid. This may account for the conditions in the contractures seen in different cases.

SURGICAL REPAIR OF BLOODVESSELS: ITS TECHNIQUE, ITS USES, AND LIMITATIONS

By J. Shelton Horsley, M.D.
Richmond, Virginia

Suturing bloodvessels was first put on a satisfactory basis by Carrell, who established the principle that successful suturing depends upon the approximation of intima to intima with a minimum amount of injury. The chief difficulty to overcome is occlusion by clotting, and improvements in technique are intended to prevent an excessive amount of clotting. The physiology of thrombus formation is still rather vague, as it is impossible to isolate chemically some of the substances that are involved in this process, and their presence has to be taken for granted in order to support a reasonable hypothesis. There are certain general reactions, however, that all physiologists agree to. The direct formation of a thrombus is due to the action of fibrin ferment on fibrinogen. Fibrinogen exists normally in blood-plasma. Fibrin ferment is built up from various substances, and is probably formed from the action of a thromboplastic substance, called by some thrombokinase, upon thrombogen in the presence of a solution of calcium salts. Thrombokinase is not a true kinase in the sense of acting solely as a ferment, for it is used up in the process of clotting. Thrombokinase is the key to the situation, and whether it acts directly or indirectly, as Howell claims by combining with antithrombin in the blood and thus liberating prothrombin (thrombogen), it nevertheless is essential to clotting, and to a large extent regulates the quantity of thrombus formed. Thrombokinase is sup-

Fig. 1.—This drawing, reproduced from Guthrie, shows the appearance of the lumen of a bloodvessel immediately after it is sutured by the method of Carrel. Note the large amount of thread exposed in the lumen.

Fig. 2.—This drawing, also from Guthrie, shows the appearance of the lumen of the bloodvessel several weeks after successful suturing. The stitches have been covered by endothelium which is still partly transparent. The older the specimen, the thicker and more opaque becomes the covering over the sutures until after several months the stitches are completely hidden from view. This is true of any method of suturing, whether the mattress or overhand stitch is used. It is the first day or two after the suturing before the stitches are covered over that the amount of thread in the lumen is important. Sutures seem to work away from endothelial surfaces toward the lumen in case of the intestine and toward the surface in the case of bloodvessels.

Fig. 3.—This drawing shows the eversion of the intima caused by the double mattress stitch and the consequent absence of any raw surface left in the lumen of the vessel. Note the very small amount of thread left exposed to the blood-current as compared with Fig. 1. Note also the strong grip that the loop of the mattress stitch has on the tissue.

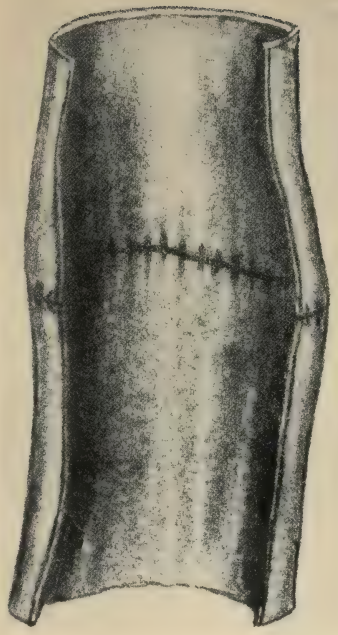

Fig. 1.

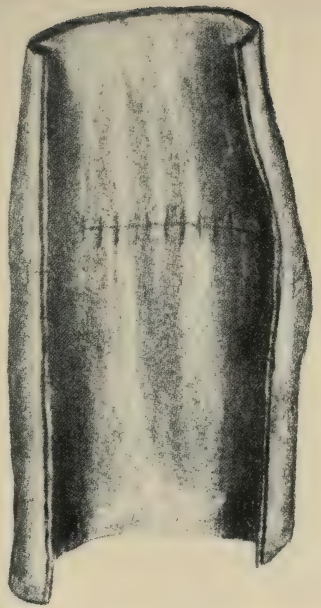

Fig. 2.

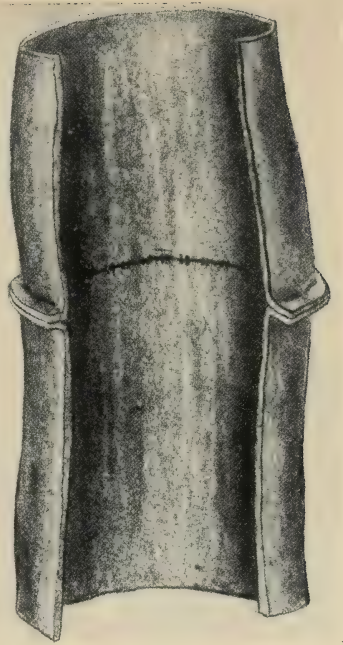

Fig. 3.

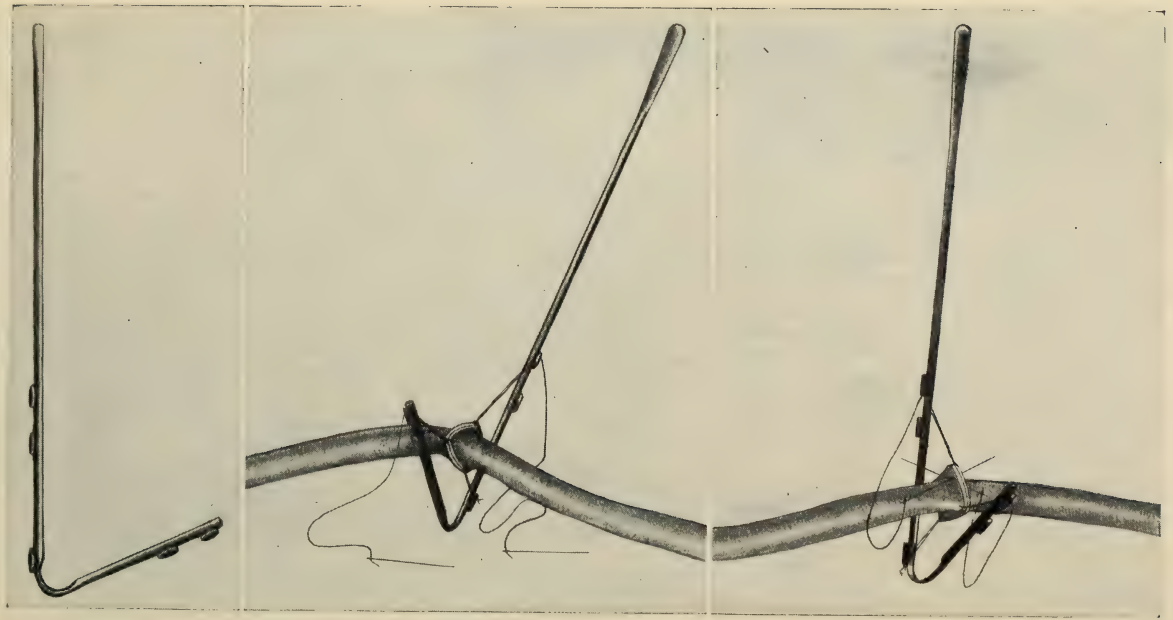

FIG. 4. FIG. 5. FIG. 6.

FIG. 4.—The arterial suture staff. For description see text.

FIG. 5.—The three guy sutures have been placed and fastened to the buttons on the staff. The threaded ends from the last two sutures are left long for further suturing. The circumference of the vessel is made triangular and the intima is everted by the tension of the spring of the suture staff.

FIG. 6.—The handle of the staff is upright and the whole instrument is lifted up somewhat to increase the eversion of the intima. The continuous double mattress, or cobbler's stitch, has been started using the threaded ends from the last two guy sutures. The needles are thrust through the margins of the artery near the insertion of the second guy suture. The needles should be inserted at about right angles to each other so that they can be handled better. The suturing in this third is done toward the operator, that is, from the second to the third guy suture.

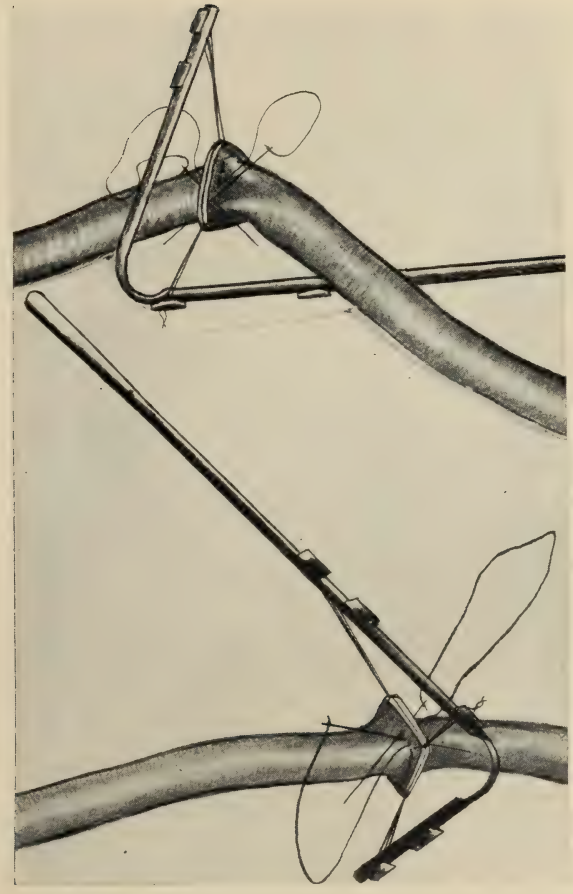

Fig. 7.—The handle of the staff is depressed until it is horizontal and points away from the operator. The whole instrument is shoved toward the operator so as to increase the eversion of the intima in the second third. The suturing is continued as a cobbler's stitch.

Fig. 8.—The handle of the staff is then brought over to a horizontal position toward the operator. The instrument is lifted up so as to increase the eversion of the last third. The suturing is continued toward the second guy suture.

FIG. 9.—The handle of the instrument is brought to a vertical position and the threads tied. The distal serrefine is slightly relaxed while the short shaft is pressed toward the long shaft, so relaxing the tension of the spring. If any markedly spurting point is seen, an extra suture can be inserted.

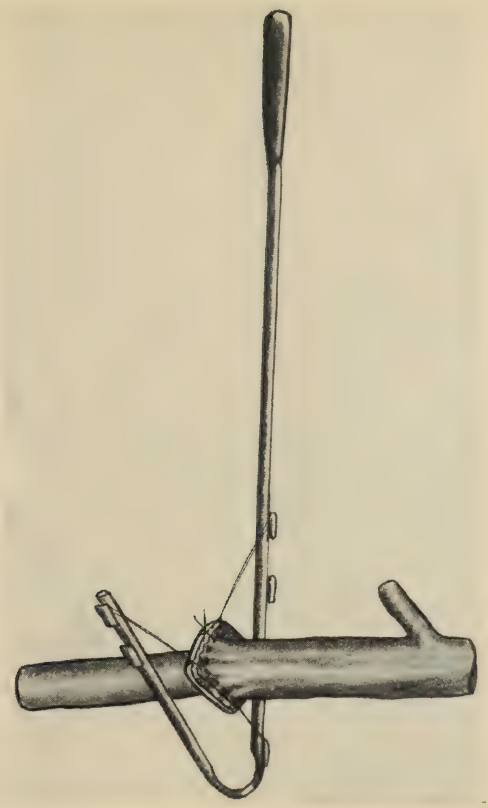

FIG. 10.—Showing the method of suturing applied to transfusion of blood. On the right is a vein which is somewhat larger than the artery. The vein has a branch through which a smooth probe covered with vaselin can be inserted and carried up into the artery if obstruction occurs. By pressing on the main trunk of the vein clots are blown out through the branch.

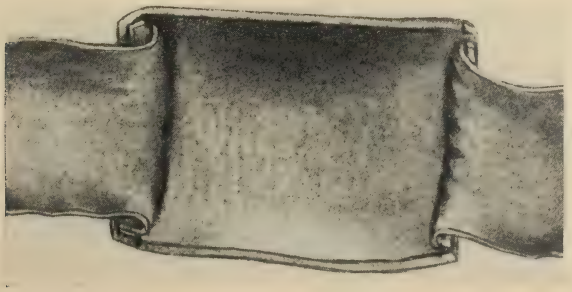

FIG. 11.—Showing a piece of rubber tube sutured in between the cut ends of an artery. Note the complete absence of any sharp margin of the tube and the absence of thread in the lumen. This cannot be done by the regular overhand suture.

Fig. 12

Fig. 13

Fig. 14

Fig. 15

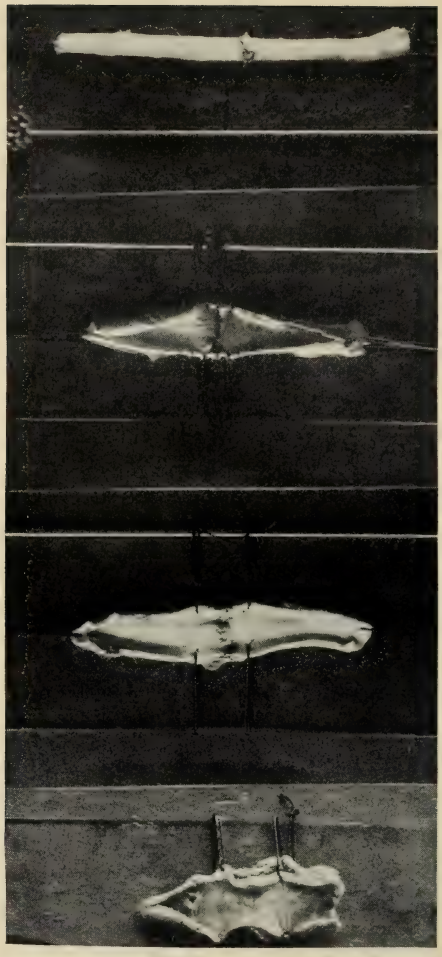

Fig. 12.—Photograph of an iliac artery of a dog which was removed a few minutes after suturing after the blood had been turned on and no leakage appeared. Note the eversion of the intima constituting a flange without diminution of the caliber.

Fig. 13.—Photograph of the lumen of carotid artery of a medium-sized dog. The blood had been allowed to flow for a few minutes and there was no leakage. Note the absence of thread in the lumen.

Fig. 14.—Photograph of a carotid artery eleven days after being sutured. The lumen is smooth. The stitches have stretched and are visible beneath the transparent coating of endothelium.

Fig. 15.—Photograph of a femoral artery thirty-three days after operation. The stitches are barely visible. A small black speck in the upper edge shows the line of sutures. The covering over the stitches is thicker than it usually is in this time, but the specimen illustrates, as compared with the previous figure, how the stitches are gradually buried.

Fig. 16

Fig. 16.—Photograph showing external appearance of a section of external jugular vein which was sutured in between the divided ends of a carotid. The specimen was removed twenty-four hours after operation. It is collapsed and free from clots.

Fig. 17

Fig. 17.—Photographs of a segment of external jugular vein which was sutured in the place of a resected portion of the right carotid of a large dog. Note the valves about the middle of the specimen in one of which is a small clot. The specimen was dilated at this point probably from the force of the blood-stream in overcoming the valves. Otherwise the intima is perfectly smooth and the sutures are mostly buried from view. The specimen was removed sixty-three days after operation.

Fig. 18

Fig. 18.—Photograph of specimen of reversal of circulation in the neck. The proximal end of the carotid was sutured to the distal end of the external jugular vein in a medium-sized dog. This specimen was removed after thirty-nine days. The sutures are distinctly buried, though the endothelium over them is still transparent at places. The line of suturing is perfectly smooth. A short distance from the line of sutures are the crumpled-up valves which were forced and broken down by the blood-stream.

Fig. 19.—Photograph of a dog in which a portion of the abdominal aorta was resected and a section of rubber tubing coated with paraffin and vaselin was sutured in to fill the defect. The dog made a perfect recovery. The photograph was taken six months after operation. The dog was killed and the specimen which was removed showed the tube completely encapsulated but occluded. The occlusion had evidently been gradual, as there were no bad symptoms and no paralysis of the legs. A gradual occlusion in such cases which will permit of time for collateral circulation is clinically as satisfactory as if the tube remained permanently open.

posed to be present in all tissues of the body and also comes from disorganized blood corpuscles, particularly the platelets. It seems abundant in the adventitia of bloodvessels.

The practical bearing of these facts upon bloodvessel surgery is very evident, for thrombokinase can only be liberated from injured tissue. As the amount of clotting is directly proportionate to the amount of thrombokinase, it is readily seen that any undue injury to bloodvessels by rough handling, or by drying of the endothelial cells of the intima, or by the presence of too much foreign substance in the lumen, or by chemical or bacterial injuries, will result in the liberation of so much thrombokinase that excessive thrombus is formed and the vessel is occluded. Even the most successful suturing of bloodvessels is accompanied by some clotting, but a limited amount is essential, as it serves to fill the punctures from the needle holes and to bridge over the line of contact. In successful vessel suturing, however, the injury is so slight that very little thrombokinase is released, and consequently only a small amount of thrombus is formed, just enough to plug the punctures made by the needle and not enough to occlude the lumen.

We recognize, then, as the principles for successful bloodvessel surgery, that a continuous surface of vascular endothelium must line the lumen, and that as little injury as possible must be done this endothelium. The importance of presenting to the lumen of the vessel a continuous surface of vascular endothelium is appreciated when we recall what has been learned in a somewhat coarser fashion by intestinal suturing. Here it is a well-recognized principle, as it is in bloodvessel suturing, that the endothelial surfaces must be approximated accurately. In the case of the bowel, the endothelium is on the outside, and it is necessary to turn in a small flange or shelf to secure accurate apposition of the peritoneal endothelium. In bloodvessels the endothelium is on the inside, and it is essential to turn out a flange in order to approximate the endothelial lining of the blood-

vessel. The usual method of suturing bloodvessels consists in first placing three guy sutures and then whipping the edges of the vessel together by an overhand stitch. This necessarily cannot approximate the endothelial surface on the inside as accurately as would a mattress stitch which turns out a flange and compels the apposition of the intima. No one would think of suturing a bowel in a similar manner, and claim that the peritoneum could be accurately brought together by merely whipping over the margins of the bowel wound as in suturing skin. If this cannot be done in intestinal surgery the same thing holds equally in bloodvessel surgery.

The presence of foreign substances in the lumen of a bloodvessel promotes clotting. Some substances favor clotting more than others. A coating of vaselin or paraffin retards clotting. Other things being equal, however, the larger the amount of foreign substance or raw surface in the bloodvessel the greater the likelihood of extensive clotting. A mattress suture which turns out a flange not only approximates the intima more accurately, but leaves almost no thread exposed in the lumen; whereas the regular overhand stitch leaves a considerable amount of thread in the lumen. This is readily seen in Fig. 1, which is reproduced from Guthrie's work on bloodvessel surgery, and shows the inside of the vessel soon after being sutured by the usual method. The mattress suture which is parallel to the wound also secures a better hold upon the tissues than the overhand stitch, which is at right angles to the wound and the mattress stitch is consequently less liable to cut (Fig. 3). This is due to the fact that in the mattress suture the tension is more equally distributed along the whole loop of the stitch, whereas in the overhand stitch the tension is concentrated at one point, that is at the end of the suture farthest from the wound. This fact has been brought out by Lexer in the following case:[1]

[1] Jour. Amer. Med. Assoc., May 10, 1913, p. 1474.

"Lexer, of Jena, showed a case of ideal operation for aneurysm and transplantation of the vessels. The patient was operated on according to the rules established by Lexer in 1907. To maintain the circulation in its normal channel, the spindle-shaped aneurysm beginning above Poupart's ligament and extending below the arteria profunda, was removed and the defect of the vessel repaired by the introduction of a piece of the saphenous vein, 18 cm. long. The wall of the artery markedly changed by arteriosclerosis allowed the threads of the running suture of Carrel to cut through. On the other hand, the continuous protruding mattress suture gave very good service; the thread not only held well but also prevented hemorrhage."

Asepsis in bloodvessel suturing should be as nearly perfect as possible, just as it should be in abdominal surgery, brain surgery, or bone surgery. If the tissues around the bloodvessels are infected no suturing can be expected to be satisfactory. Yet even in the presence of infection it is not invariably a failure, as I have one successfully sutured femoral artery in a dog in which the tissues around the vessel suppurated for several weeks. As a rule, however, infection will result in failure, and the proper aseptic technique should be insisted upon. Particularly should dust infection be avoided. The operator should wear a mask over his mouth and the floor of the operating-room should preferably be moist. In laboratory work the floor should be flushed with water an hour or two before operating. The manner of handling tissues is most important, for gentleness is an absolute essential. No matter how careful the aseptic technique, good results cannot be secured by one who uses the same methods of handling tissue in bloodvessel surgery as would be adopted in bone surgery. The vascular endothelium should not be permitted to dry, and should not be touched with any instrument.

As for instruments, I use No. 16 straight needles threaded with 00000 twisted black silk. They are threaded with silk

about fourteen inches long, and a single knot is tied on the eye of the needle to prevent it becoming unthreaded. The short end should be cut within half an inch of the needle to avoid unnecessary loose ends dangling about. Five of these threaded needles are run through a piece of gauze of double thickness about two inches wide and as long as the thread. This gauze is then placed in a small can or ointment jar that is one-third full of white vaselin. More vaselin is put over the gauze and the jar is fastened and sterilized. The needles are not removed until they are to be used, when they are taken from the gauze, and the gauze, which is thoroughly impregnated with vaselin, is laid beneath the artery to protect it from the surrounding tissue. It is necessary to have the arterial suture staff[1] which has been fully described in other publications. It consists of two small shafts of steel united by a spring so that the short shaft forms an angle of about 60 degrees to the long shaft. There are two buttons on the end of the short shaft, two about opposite to these on the long shaft, and one near the spring on the long shaft (Fig. 4). In order to occlude the vessel, either a rubber-covered Crile clamp is used, or the ordinary serrefine or bull-dog clamp, uncovered, which has a spring so weakened that the clamp can grasp the skin of the forearm without pain. The inside of the vessel should never be seized with forceps, though sometimes it is necessary to grasp the outside. For this purpose the ordinary thumb forceps, called "frog forceps" by the instrument dealers and sold for biological dissection, are excellent. Several mosquito hemostatic forceps are often needed. Aside from these special instruments, the usual instruments may be employed. The knife and scissors should be sharp.

The vessel is exposed, keeping the tissues as dry as possible. A serrefine is placed on the portion of the vessel nearest the

[1] The arterial suture staff is made by the Kny-Scheerer Company, of New York. Powers & Anderson, Richmond, Virginia, keep in stock the staff and the set of instruments and sutures used in vessel suturint.

heart, and the vessel is then gently grasped between the thumb and finger and stripped of blood to the other angle of the wound, where another serrefine is placed. This leaves the artery dry and flat like a ribbon. The vaselinized gauze from which the needles have been removed is now placed beneath the vessel, after stopping all bleeding in the wound, and the artery divided with one stroke of sharp scissors. The fingers are wiped free of blood and moisture on a dry towel and the left finger and thumb graps one of the ends of the artery rather firmly and pull the adventitia over its cut end. The adventitia is cut off on a level with the rest of the artery. It then retracts, leaving the middle and inner coats exposed. Any remaining clots in the vessel are stripped out with the thumb and finger, and the end is held firmly between the thumb and finger of the left hand and sponged with dry gauze. As the artery is collapsed and its end held between the finger and thumb, the gauze cannot touch the intima but merely wipes the wounded portion and so removes any excess of thrombokinase. The tip of a finger of the right hand is then dipped in white vaselin and the end of the artery is smeared over with vaselin immediately after being sponged. This serves to keep back any further juices from the severed artery and also prevents drying of the intima. The other end of the vessel is treated in the same manner. All of these manipulations are done rapidly, for it is essential to complete the suturing as quickly as possible after the intima has been exposed. One of the sutures which has been prepared as directed is inserted from without inward at one end of the artery and from within outward at the other end. No more of the vessel wall should be grasped than is necessary to secure a fairly good hold. An artery is quite tough and a small bite will be sufficient. If too much is taken, the intima cannot be properly everted. The first loop of a knot is tied, bringing the ends of the vessel together. The second loop of the knot is tied while holding the ends of the suture taut, running the knot down in this manner so as to prevent

the first loop from slipping. After tying this suture the arterial suture staff is placed under the artery with the short shaft pointing toward the operator. The guy suture is fastened by wrapping it two or three times around the lowest button on the long shaft. The length of the suture from the button to the vessel should be about half an inch. The second suture is placed about one-third of the way around the circumference of the vessel and should be on the side away from the operator. The suture staff can be laid flat so that the short shaft is not in the way and the vessel ends can rest upon the long shaft, thus making it easier to insert the second suture. The second suture is inserted and tied in a manner similar to the first and is wrapped around one of the upper buttons on the long shaft. The threaded end is left long for future suturing but the other end is cut close to the button. As two guy sutures are now fixed to the long shaft, the third one is easily inserted by raising up the long shaft when the point of insertion of the third suture is indicated by the retraction of the margins of the artery. The needle is inserted at the apex of the retracted margin. After this suture is tied, the short shaft is slightly compressed toward the long shaft and this guy suture is wrapped around one of the buttons on the end of the short shaft. The threaded end is left long and the unthreaded end is cut close as in the second suture. It is important to have no unnecessary ends hanging loose. The short shaft is released and the spring makes tension on the margins of the artery, converting its circumference into a triangle, and everting the intima (Fig. 5).

The three guy sutures are inserted in the same way when an artery is united to a vein of much larger caliber as when a divided artery is united. Sometimes it is a little more difficult when a small artery is united to a large vein, but after the guy sutures are once inserted, the rest of the procedure is identical, whether vessels of equal or unequal caliber are to be united. We now have two needles from the

guy sutures last inserted. A needle is taken in each hand and thrust through both margins of the artery in the region where the second suture was tied. The threaded needle from the third guy suture at the end of the short shaft will, of course, carry a little loop of thread, which is of no consequence. The instrument is lifted up so as to elevate the upper one-third of the wound and increase the eversion. The suture is then applied in the manner of the double mattress, or cobbler's stitch, going from the second guy suture to the third (Fig. 6). At the angles particular care should be taken to go beneath the insertion of the guy sutures; otherwise, the tension of the guy sutures may produce a wound in the endothelium which would be exposed to the lumen of the vessel. After the first third has been sutured, the handle of the instrument is depressed away from the operator and the instrument shoved toward the operator so as to increase the eversion of this third of the margin of the vessel (Fig. 7). The suturing is continued as a cobbler's stitch. When the second third is finished, the instrument is brought to its original position and each needle carried under the vessel so as to be ready for suturing the last third. The handle is then depressed toward the operator and held in such a manner as to lift up the last third and so increase its eversion (Fig. 8). The suturing is continued through the last third, and when this is finished the instrument is again brought back to its original position and the suturing carried about two stitches beyond the point of commencement, where the threads are tied to each other. Each stitch must be drawn snugly when it is placed, else the intima will not be securely approximated and there will be leakage. In the carotid of a medium-sized dog about five stitches are put in each third of the artery.

Sometimes, particularly in old dogs, retraction of the artery is marked and the sutures cannot be properly placed, as they will tend to cut out or break. If the adventitia of the vessel is grasped with curved mosquito forceps about

one and one-half inches from the severed ends, the two ends of the vessel can be shoved together by an assistant without tension on the sutures and without his hands being in the way of the operator. This is better than trying to approximate the ends by the serrefine clamps which may either come off or loosen and flood the vessel with blood. After the suturing has been completed, the short shaft is slightly compressed toward the main shaft so as to relax the tension on the guy sutures and the distal clamp on the vessel is slowly released (Fig. 9). If there is marked spurting at any point, an extra suture should be placed there. With a little experience spurting rarely occurs, though there is usually oozing of a few drops of blood. The guy sutures are then cut and the instrument is removed. The sutured vessel is very gently compressed with dry gauze and the distal clamp is entirely removed. After about a minute the proximal clamp is slowly removed. In this time the needle holes should be plugged with fibrin and there should be no leakage. The vessel must not be returned to its bed until leakage has ceased. The whole procedure of suturing the vessel, from the insertion of the guy sutures to the last stitch, can easily be done in from ten to fifteen minutes and often in less time. Any competent surgeon who tries this technique experimentally a few times can master it.

This technique has been mentioned in three previous articles.[1] The arterial suture staff has not been altered and the general principle of approximating the intima has always been adhered to. However, a great many details of applying this principle have been changed, and I think these changes add to the efficiency of the technique. The suture staff, which holds the vessels so that the edges are everted and each stitch is inserted under the same tension from the first to the last, greatly facilitates the suturing and makes pos-

[1] Annals of Surgery, February, 1912; Jour. Amer. Med. Assoc., July 6, 1912, p. 4, and December 14, 1912, p. 2149.

sible the carrying out of the principles that have already been noted.

The changes from the other publications are as follows:

1. A double mattress or cobbler's stitch is now used instead of the single mattress stitch as originally advised. It was found that when the single mattress stitch was used, there were points between sutures with but little compression and no raw surface. This sometimes made a small amount of leakage that was difficult to control; also a little diverticulum would be formed that was a weak spot and would occasionally result in secondary hemorrhage. The double mattress stitch does away with these objections, and approximates the intima firmly as by a fine clamp around the entire margins of the vessel and at the same time exposes no more thread in the lumen than is exposed by the single mattress stitch. The use of this stitch can be readily acquired by anyone who tries it. It has been most successfully used in intestinal suturing by Crile, and is much more needed in vessel suturing, as there is more pressure in a bloodvessel than in the bowel.

2. No salt solution is now used to wash out the vessels. It has been the object of this technique to eliminate as far as possible every procedure that is not essential to success. Washing out the ends of the vessel with salt solution not only adds somewhat to the trauma of the endothelium, makes a sloppy wound, and prolongs the procedure, but, according to Guthrie, rather tends to increase clotting than diminish it.

3. In order to strengthen the second and third guy sutures, both ends of these sutures are now wrapped around the buttons instead of merely using the unthreaded ends, as was formerly advised. Instead of first inserting the guy sutures and then placing them on the suture staff it is better to fix them on the staff as they are inserted. This not only relieves the necessity of handling the sutures twice, when once will do, but it is much easier to place the second and third

sutures when the first has been fastened to the staff, as the staff can then be manipulated so as to bring the margins of the vessel wound into a more advantageous position for suturing.

Sensational newspaper articles have done bloodvessel surgery much harm. The idea that a new limb can be grafted on and will remain useful or that a kidney or thyroid can be beneficially transplanted from one individual to another, is entirely erroneous. None of these experiments, even in animals, have been permanently successful. A kidney transplanted from one dog to another will probably functionate for a while, but sooner or later the fine differences of serum and tissue destroy the organ and prevent permanent success. To quote from the preface to Guthrie's monograph on bloodvessel surgery: "Heterografts succeed at first, but inevitably fail after the first few weeks. This is the disappointing but unanimous conclusion of the experimentors. Thus there is, at present, no temptation for the enthusiastic surgeon to try and graft one lobe of the thyroid or a kidney taken from a healthy donor. The poor man will not be tempted to exchange one of his sound kidneys for so much hard cash."

However, bloodvessel surgery has a very broad field, for while complicated glandular organs do not survive transplantation a simpler tissue does. A bloodvessel, for instance, can be transplanted from one animal to another and may functuate indefinitely. The four fruitful fields of bloodvessel surgery at present are:

1. Wounded bloodvessels. Here direct suture can be used, or if much of the vessel has been injured, a segment of some vein from the patient's own body, as the saphenous, can be sutured in the defect.

2. In excision of malignant tumors which have been heretofore considered inoperable because of involvement of a large bloodvessel, a section of the vessel can be removed and the vessel repaired as for trauma.

3. Aneurysms may possibly be treated in a similar way, though on account of the diseased condition of the vessel wall it is not likely to be so satisfactory as in surgery following trauma. However, several successful cases have been reported, as the case of Lexer referred to above.

4. Transfusion of blood. There are a great many ways of performing transfusion of blood, but probably no method can be quite so ideal as that which permits the flow of the oxygenated arterial blood of the donor directly over an endothelial surface into the veins of the patient. While numerous instruments have been devised for drawing blood from the donor into a receptacle and then injecting it, even in the short space of time when the blood is not in contact with endothelial surfaces there may be some changes that will render it less valuable. Certainly it is better to have it directly transferred to the venous system of the patient. The various tubes and cannulas are often of great service, but if they do not work, the whole operation will have to be done over again.

In the method of suturing just described, when applied to transfusion a vein should be selected sufficiently large and with a nearby branch (Fig. 10). If for any reason an obstruction occurs at the suture line the finger can be placed on the main trunk of the vein, and the sutured area gently manipulated between the thumb and finger, when the clot will usually be blown out of the venous branch. If this is not successful, and especially if the radial artery from which the blood is taken contracts too greatly, a smooth probe covered with vaseline can be introduced through the venous branch, and carried up through the sutured region into the radial artery. When the probe is withdrawn a full flow of blood follows. It is impossible to do this if a cannula has been used. After a probe has been once introduced in this manner, clotting occurs in from five to ten minutes, but a free flow of blood for twenty minutes is all that is necessary in most cases, and it is better to do this simple procedure

two or three times than to perform the whole operation over again. If for any reason the suturing does have to be done again, a small section, including the sutures, can be removed and will leave enough of the artery and vein to bring together again; whereas, with a cannula so much of the artery and vein is tied off that enough will hardly be left for another operation.

The photographs of specimens show some of the work that has been done by this method. A rubber tube has also been sutured in after resection of an artery (Fig. 11). These experiments have not yet been completed, and a report will be made later upon this feature. However, I do not believe a rubber tube can be sutured satisfactorily into the defect caused by resection of an artery by the overhand method, as the tube will leave sharp edges of the rubber exposed to the blood current, whereas the mattress stitch prevents this by everting the edges of both the tube and the artery.

DISCUSSIONS ON THE PAPERS OF DRS. DANNA, SHERRILL, AND HORSLEY.

Dr. R. S. Hill, of Montgomery, Alabama.—I am sure we have been not only very much interested but very much instructed by the papers to which we have just listened. Especially instructive have been the experiments reviewed by Dr. Horsley. My interest, however, is more in the heart case reported by Dr. Danna, for, although my time has been chiefly devoted to the study and treatment of the diseases peculiar to women, there is no subject that is of greater interest to me than penetrating wounds of the heart. This interest began with seeing a case in the service of my brother, Dr. L. L. Hill, of a needle stuck in the heart of a little girl. The external end of the needle could be seen playing under the skin with each beat of the organ. It was successfully removed under local anesthesia. This interest was increased when I assisted Dr. L. L. Hill in the removal of a piece of hatpin from the heart of a negro man. The man suffered comparatively little inconvenience so long as he occupied the upright position, although

his pulse was irregular. However, when he undertook to lie down he had considerable pain, the irregularity of the heart beat became much worse, and he breathed with great difficulty. The foreign body was removed by a modified Rotter operation. This interest in heart wound reached its highest point when I assisted Dr. L. L. Hill in suturing a stab wound of the heart. From the very nature of things, comparatively few of us will ever have a hand in suturing the human heart, but I dare say those of us who have been so fortunate as to have taken part in this operation will never forget the experience. No man who has held in the palm of his hand the throbbing human heart, disrobed of its coverings, and bleeding at every throb, who has seen the gaping wound effectually closed, and witnessed the recovery of the patient, can forget the thrill of joy that comes with such a recognition of this marvelous power of preserving human life. This boy was stabbed in the late afternoon with a penknife. It was some six or eight hours before he was operated on. At the time of the operation he was semiconscious, pulseless, cold, clammy, and restless. A few whiffs of chloroform sufficed to allay the muscular efforts. The chest was opened by Rotter's method and the pericardium was found very much distended with blood. As soon as this sac was laid open and the accumulated blood removed the heart beat improved, as was true in case just reported by Dr. Danna, showing that it was the pressure from the accumulated blood in the pericardium that was impeding the heart action. It is estimated that the pressure from seven to eight ounces of fluid quickly injected into the pericardium will stop the action of the heart, though of course a very much larger quantity of fluid may slowly collect in this sac without greatly interfering with the action of the organ. Passing my left hand under the heart, I practically tilted its apex out of the chest cavity, Dr. L. L. Hill then placed a catgut suture which controlled the bleeding and closed the wound. Right here I wish to say that I cannot endorse Dr. Danna's tying the heart sutures so tightly as to cause them to cut into the myocardium with the object of burying them in the structure of the organ. If sutures are tied too tightly there is danger of a necrosis, and consequently a weakening of the myocardium should the patient recover, which may subsequently rupture. The fourth case of heart wounds that it has been my privilege to see was from a pistol shot. With suicidal intention an alcoholic-soaked subject inflicted the injury. He was brought to

the hospital at once in a condition of severe collapse. His chest quickly opened by Dr. L. L. Hill, the bullet had ploughed along the wall of the left ventrical, making a groove of some length opening near its middle into the cavity of the heart. This hole was plugged by a clot of blood. It is of course much more difficult to close a pistol than an incised wound. However, unusual trouble was experienced in this case from the cutting of the muscular tissue by the sutures as they were tied. I am convinced that the excessive and prolonged use of alcohol had caused a degenerative change in the myocardium that made it soft and so easily cut by the sutures. This patient succumbed a short time after the completion of the operation.

Dr. Walter C. G. Kirchner, of St. Louis, Missouri.—I am particularly interested in Dr. Danna's case, having seen five cases of heart suture and having operated on two cases myself. Of the two cases operated on by myself, one recovered and those of you who were present at the meeting of the Association held at Hot Springs will remember a report of these cases.

It seems to me that in the consideration of these cases several things are important in a general way. In the first place it is important for the surgeon, who is likely to have emergency work of this kind, to have a definite plan of operation and a definite means of opening the chest so that it can be done quickly and without much confusion.

The matter of anesthesia is something that deserves consideration. In Dr. Danna's case local anesthesia was used and worked very successfully. Those who have not had experiences of this sort will be tempted to use general anesthesia, and a general anesthetic is a serious matter when the chest is opened, especially when the general anesthetic is prolonged and pushed to the degree of deep anesthesia. Under deep narcosis the function of the lung is more profoundly impaired than would be the case if the patient were only partially anesthetized. So in these cases it is much better to use light general or local anesthesia.

The danger of pneumothorax has been overestimated. In all of these cases, and in every case where I have seen the chest laid wide open the lung functionated to a moderate extent, so that the repair of the heart even under these conditions can be undertaken.

The matter of drainage is one of the most important things to consider, that is, whether to drain or not to drain, because although the primary results are satisfactory, the ultimate

results coming from infection are often such as to take away the patient. In general, I think it is better to avoid drainage, especially of the pleural cavity, because that cavity when once infected is difficult to handle. The diagnosis is also important in this connection. It is to be remembered that hemopericardium, that is, the presence of excessive blood in the pericardium, is an important symptom of injury to the heart, and one of the first things to do with a case of this sort, after feeling the pulse, and assuring one's self that the heart's action is impaired, is to introduce the finger into the wound, and allow the blood to flow out of the pericardium, and then you will find that the pulse comes up and gives us time to operate on the base.

There are a great many other points that have come up in connection with this work, and the Doctor's paper has been very instructive to me.

In regard to bloodvessel suturing, I have substituted in the case of traumatic aneurysm of the brachial artery a section of the basilic vein, and it has worked successfully; also in the case of traumatic injuries of the popliteal artery I have sutured it successfully and have been able to save the limb. I think all these measures brought out in Dr. Horsley's paper should be resorted to when possible and when the case demands it, because extremities very often can be saved which otherwise would be sacrificed.

Dr. Herman J. Boldt, of New York City.—Dr. Kirchner has referred to the question of anesthesia and has called particular attention to the danger of using general anesthesia and sometimes to the ineffectiveness of local anesthesia. I would simply throw out the suggestion that perhaps in this class of cases rectal anesthesia might well be substituted. It is customary to prepare the bowel for rectal anesthesia, and 75 per cent. of ether and 25 per cent. olive oil will usually prevent the proctitis that is said to take place after rectal anesthesia.

Dr. Francis Reder, of St. Louis, Missouri.—The technique of vessel suture, as pointed out by Dr. Horsley, is of considerable interest. Some years ago the flange method of suturing vessels was called to my attention by observing the flange connections of a water main. As Dr. Horsley has said, the principal object of successful suture is to avoid the protrusion of anything foreign into the lumen of the vessel. The only method of accomplishing this seems to be through the use of the mattress suture. The suture I have employed may be considered only

a refinement in this technique. Instead of placing the mattress suture parallel to the plane of intestine, I have taken this suture and placed it vertical to the axis of the vessel. With the mattress suture placed vertically I have been able to overcome the difficulty that was experienced when the suture was placed as Dr. Horsley has described, that is, puckering of the intima and the formation of minute sacculations and lacumæ with a narrowing of the lumen of the vessel when the suture was tied. The mattress suture placed vertical to the axis of the vessel requires perhaps a few more sutures. Should, after this method of suturing, any oozing be evident it can be remedied by running a simple suture about the edge of the flange; this suture will not come in contact with the blood stream.

Dr. I. S. Stone, of Washington, D. C.—I would like Dr. Sherrill to tell us how much usefulness of the arm was preserved or how much value is the arm to the patient.

The President.—If there is no further discussion, I will ask Dr. Danna to close.

Dr. Danna (closing the discussion on his part).—I want to thank the members for their kind attention, and especially those who have taken part in the discussion. It was my purpose merely to report the case and not really to discuss the subject of injuries of the heart in general. I am very glad Dr. Hill brought up the point of operating for the removal of foreign bodies in the heart. The ease with which the operation was performed, the ready exposure of the heart, made me feel that the heart was an organ for surgical interference in a number of cases and in a number of conditions that I had up to that time considered out of the surgical field.

With reference to tight suturing, when I stated that the sutures were put in rather tightly I did not mean that we put them in so tightly as to do harm to the myocardium. My object in making the suture tight was to bring about the result Dr. Horsley speaks of in his bloodvessel suture. I wanted the suture to be sufficiently tight to cause a moderate amount of elastic pressure on the intima, on the endocardium, having in mind the condition that is produced in the skin when we have a silkworm-gut suture in the skin. If it is a little tight and left in long enough it will bury itself in the skin and the skin will heal over. My idea was to get muscle in the endocardium, and as long as the muscle was elastic, I figured that if I made the suture a little tighter than necessary to get apposition I would get the desired result.

I am glad the point about pneumothorax was brought up. I believe myself that the harm done by the entrance of air into the thorax during operations has been very much overestimated. If you are on the lookout for it and will prevent the lung from collapsing, by stopping the opening with a wet sponge or something of the kind, I believe you can go on with the operation. I have a number of times accidentally opened the thorax in thoracic surgery of other kinds, and I have never had any serious untoward result.

Regarding anesthesia, I worked over this case practically without anesthesia and found it so satisfactory that I do not believe I would undertake to give a patient of this kind a general anesthetic.

Dr. Sherrill (closing the discussion on his part).—I wish to emphasize especially the remark of Dr. Kirchner in regard to pneumothorax and also in regard to drainage. I have had experience with one injury of the heart which was not successful and learned some things from that case. One thing was that the anesthetic did not seem to affect my patient at all harmfully. Another thing was that pneumothorax was practically to be considered negligible; and a third thing is that in holding the heart it is well to use either the gloved hand or forceps which will not bite into the tissues of the heart. I unfortunately was not quite prepared for my heart work and grasped the heart with hook forceps which made a bigger wound in the heart than was present when I saw it. It was very easily shown in the heart. The wound in the heart healed perfectly and the patient died of a wound in the liver which I had overlooked. The patient received a stab wound in the chest in the costal cartilage; apparently the man had twisted the knife in taking it out. Postmortem examination showed that the patient had been stabbed two or three times, the knife striking between the pericardium and chest wall and going down into the abdomen, perforating the liver, and the patient died from a wound of the liver which was overlooked in this manner. This is a point well worthy of consideration in connection with future work. The points I would emphasize are the danger of grasping the heart with a hook forceps and the danger of overlooking an injury of this kind.

One point in connection with Dr. Horsley's paper was very important—namely, in what size vessel it is permissible to make this eversion of the coat without making constriction?

In regard to the usefulness of the limb, a question asked by Dr. Stone, I will say that the patient has considerable vigor in carrying things on the forearm. He has some prehensile ability and can pick up things to a small degree with the fingers, but the result is not as satisfactory as I had hoped to obtain in this case, and I am very sorry some of the members did not address themselves to this point in my paper, because I expected to learn something in regard to the treatment of this case.

Dr. Horsley (closing the discussion).—Answering Dr. Sherrill's question, I will say that a small bloodvessel does not need suturing for primary repair because there is usually such good collateral circulation. For instance, the radial or ulnar can be tied without impairing the circulation of the hand because of the excellent collateral circulation in the hand. Merely turning back a cuff of elastic tissue does not produce any material constriction.

In regard to paralysis, in all cases of resection of the abdominal aorta that I have done experimentally (about six), paralysis has occurred except in the one successful case. Only one out of six was successful, and that case had no paralysis of the hind legs, and all others had paralysis, usually beginning immediately. This shows that the paralysis is due to the deprivation of blood to the distal nerve terminals in the leg itself.

With reference to the criticism made by Dr. Reder, it takes no longer to put in a cobbler's stitch than a single mattress suture, The idea is to have the intima without pockers and as smooth as possible, and a cobbler's stitch (a double mattress) inserted parallel with the lumen and drawn snugly gives a smooth interior of the vessel without any diverticula.

ELEMENTS FREQUENTLY OVERLOOKED BY SURGEONS IN THE TREATMENT OF EXOPHTHALMIC GOITRE

By A. J. Ochsner, F.A.C.S., M.D., LL.D.
Chicago, Illinois

In 1891 I removed the thyroid gland for the first time for the relief of exophthalmic goitre.

During the twenty-two years that have intervened, I have followed the literature upon this subject in the English and German languages especially, with some care and much attention, more especially since I began the preparation of the book upon this subject.

Many important elements have been brought out by different authors, and I have had an opportunity to test the correctness of these in the treatment of an enormous number of clinical cases. It has seemed worth while to collect all of the elements which have an important bearing upon the success of surgical treatment in one short paper, although each one of these is of sufficient importance to serve as the text for many extensive discussions.

1. I wish to direct attention to the physiological phenomena of hyperthyroidism which has been discussed in so scholarly a way by Schmauch and others. It seems that when the body is about to be called upon to perform some unusual physiological feat the thyroid gland is the first to get ready and to prepare its secretion for the occasion. This is true especially during times when important new tissues have to be produced, as in the case of pregnancy or at the approach of puberty, when marked increase in the pelvis and in other portions of the body is produced.

This activity is so great that very frequently a marked hypertrophy of the gland can be observed. In fact, this may take so active a start that it will not be possible to return to the normal which nicely balances the amount of production with the physiological demand. But the same increase in production may be observed when the person is subjected not to trophic strain, but to physical or mental or emotional strain, and in each of these instances it may be impossible to return to the normal amount when the cause for a physiological increase has disappeared

2. There is another form of physiological hyperthyroidism which has been pointed out by Wilms, who found that the medical students afflicted with large simple goitres, coming from goitre districts to universities located outside of these districts, commonly show symptoms of hyperthyroidism a short time after entering the University and that when these young men return to their homes the hyperthyroidism speedily subsides.

This seems to indicate that the increased secretion was a physiological manifestation so long as the organism had to overcome abnormal conditions present in the carrying on of his physiological functions while he was drinking the contaminated water at home, but that the same amount of secretion from his hypertrophied gland gave rise to characteristic symptoms of thyroid poisoning as soon as the person drank pure water.

It is, of course, plain that by overlooking these elements the surgeon places himself in a position in which he cannot make use of all available means favoring a cure.

3. There seems to be a large class of patients who are really constantly under the influence of excessive thyroid secretion, but who seem to maintain a balance unless some very unusual and generally unexpected strain, either physical, mental, or emotional, comes upon them, and then there is a sudden overwhelming hyperthyroidism which may be only temporary in its effect or which may be so severe

as to destroy the life of the patient. Crile has dwelt upon this feature not so much with cases in which the balance had been maintained as with those in which the balance has already been strongly on the side of disabling hyperthyroidism. The surgeon who underestimates the importance of this element will experience serious disappointment in his attempts at thyroid surgery.

4. During the early stages of thyroid surgery, Kocher constantly directed our attention to the fact that in serious cases good judgment would suggest the use of partial operations, the ligation of one or two or even removal of one lobe or a portion of one lobe. The benefits from the use of this element in the surgical treatment of all cases in which there is any doubt concerning the surgical margin of safety is of the very greatest importance, and one that is more frequently overlooked than any other.

5. The periodicity of hyperthyroidism and the variation in severity in most cases has been pointed out constantly, especially by C. H. Mayo, showing that most cases that have come under treatment in a condition of exceedingly high hyperthyroidism have had similar periods before followed by a condition much nearer normal, and that consequently it is reasonable to suppose that by the use of physical, mental, and emotional rest the acute condition can again be bridged over and a condition of relative freedom of hyperthyroidism can be awaited when the margin of safety for operation will be many times greater, and consequently there will be an enormous decrease in operative risk if instead of operating at once in these cases the best time for operation is awaited. Disregarding this element is undoubtedly the cause of a considerable number of deaths during the early experience of most thyroid surgeons.

6. Traumatism during operations undoubtedly has some bearing not only upon the amount of shock and the postoperative comfort of the patient, but also upon the safety of the operation, because its absence is likely to be followed

by a greater degree of absence of postoperative hyperthyroidism than in cases in which the tissues have been traumatized unnecessarily.

7. In the same line comes the matter of drainage, not for the purpose of preventing accumulation of septic material, but for the purpose of draining the blood and serum which might accumulate and whose reabsorption seems to give rise to distinct signs of postoperative hyperthyroidism a fact which was emphasized by Kocher, and which has been constantly recalled by most workers on thyroid subjects.

8. The uselessness and, in fact, the harmfulness of heart stimulants and the very serious danger in the use of thyroid extracts should never be lost sight of, because it is really of the utmost importance. I have myself seen a considerable number of deaths which could undoubtedly have been avoided had the patient's exhausted dilated hearts not been subjected to the murderous effect of iodin, thyroid extract, or digitalis.

9. There is undoubtedly danger in the careless use of anesthetics. By giving 0.25 grain of morphin and 0.01 grain of atropin hypodermically half an hour before beginning the administration of ether by the drop method, then anesthetizing the patient thoroughly in the horizontal position, then elevating the head of the table to 45 degrees, and finishing the operation without the further use of an anesthetic, the dangers from anesthesia can be practically eliminated, the pulse rate almost invariably becomes slower, and the pulse stronger and more regular during the operation.

A surgeon with a personality that will enable him to use suggestive therapy can use the morphine and atropin in the same manner and then apply 1 per cent. of cocain to the line of incision in the skin and 0.5 to 1 per cent. novocain for the deeper structures with the same degree of safety.

10. Probably the most important element and the one which has been most commonly overlooked is the matter

of caring for these patients after they have fully recovered from the operation.

These patients, as a rule, would never have developed hyperthyroidism, had they lived approximately normal lives. Unless the surgeon tyrannizes over them, they are not likely to live normal lives after the operation, and consequently they are bound again to wreck their physical powers in some way unless prevented by carefully planned directions.

We have given these patients a set of written rules, which I will add, and by having them report and insisting upon their following these rules we have been able to avoid almost entirely the bad late results in operated cases which are so common in cases which are left to themselves after operation.

As has been demonstrated, especially by Landstrom, even with all of these precautions, tissues which have once become degenerated as a result of long-continued hyperthyroidism cannot be restored, neither will a dilated heart return to normal although the tachycardia and the tremor and exophthalmos and many of the other symptoms may disappear. The dangers from faulty technique resulting in injury to the recurrent laryngeal nerve, the parathyroid gland, the distended veins of the neck and the trachea, need not be mentioned here, although it may be well to state that paralysis of the recurrent laryngeal nerve and injury to the parathyroid glands are much more common in the reports of those surgeons who systematically exposed the recurrent laryngeal nerve where it crosses the inferior thyroid artery than in the reports of those who leave the posterior capsule and the underlying tissues containing the lower parathyroid gland and the recurrent laryngeal nerve undisturbed.

Directions following Operation for Goitre.—It is of the very greatest importance that the following directions be carried out as nearly as possible not only to thoroughly

reëstablish health and strength in your case, but also to maintain this after it has been established.

It is very important for you to bear in mind that you cannot safely be careless in the future even though your health may be excellent.

1. Avoid all excitement. If anything annoys you, put it off for a week.

2. You should get an abundance of rest, by going to bed early and taking a nap after luncheon regularly if possible.

3. You should have an abundance of fresh air at night, consequently you should sleep with windows wide open.

4. You should take nothing that irritates the nervous system, like tea, coffee, or alcohol. Of course, you should not use tobacco in any form.

5. You should eat very little meat. If you are very fond of meat, take a little broiled or stewed beef, mutton, or breast of chicken, or fresh fish once or twice a week. You should eat nothing that has been fried.

6. You should drink a great deal of milk or eat things that are prepared with milk, such as milk soups, milk toasts, etc., also cream and buttermilk are especially good for you.

7. You should avoid beef soup, beef tea, and all kinds of meat broths.

8. You should eat an abundance of cooked fruits and cooked vegetables, or very ripe raw fruits, or drink fruit juices prepared out of ripe fruits.

9. You should drink an abundance of good drinking-water, or if this is not available, you should boil all drinking-water for twenty minutes.

10. You should avoid all excitement or irritation, like attending receptions, shopping, church work, and politics.

DISCUSSION

Dr. Charles H. Mayo, of Rochester, Minnesota.—Dr. Ochsner has presented this subject so thoroughly that there is

very little more to be said. It is difficult to control these patients after operation. Sometimes I think it as easy to operate on them again as to advise them with regard to the after-care, since they so often disregard instructions. In some of these cases the intoxication is not necessarily from the thyroid. All kinds of intoxication may come under the same classification. Some people who take considerable alcohol have a type of myocardial change: changes in the liver, and changes in the kidney. They have a tremor, and the slight additional shock of operation may bring on delirium tremens. These patients are usually seen at the height of an attack, and are often subjected to operation with great risk at an inopportune time, as the case is taken to be chronic and emergent.

Another important point Dr. Ochsner emphasized was the physiological activity of the thyroid. It is one of the sex glands of the body, and in the development of the pelvic organs we have hyperemia of this gland. There is no gland in the body that has received more care on the part of Nature than the thyroid. It has as much to do with development as the thymus gland. It is five and a half times as vascular as the kidney. It receives in proportion to its weight and size twenty-eight times as much blood supply as the entire head, and receives thirty-four times as much as the brain.

I believe there are many cases of myxedema that are not recognized, that is, partial myxedema. There are also many cases of hyperthyroidism that are not recognized, but some of them are recognized too soon. In many instances, a woman having a little tremor and a rapid heart is believed to have exophthalmic goiter and operation is advised. I have observed many such cases that were not exophthalmic goiter. I wish I knew what they were, but certainly they were not cases that could be improved by operation. If we had the same impressive way of telling our patients what to do that Dr. Ochsner has, and some way to make them do it, we should accomplish far more than we have done heretofore.

Dr. Ochsner (closing the discussion).—In our early cases we neglected to tell these people what to do after operation, concerning diet, rest, absence of mental nervous irritation, and general hygienes, and we had a lot of trouble from this cause. Since we have insisted upon sensible living after operation for a number of years, we find that it is really worth while.

ACCIDENTAL INJURY TO THE VENA CAVA DURING THE OPERATION OF NEPHRECTOMY

By Le Grand Guerry, M.D.
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Very briefly and in a very few words I wish to relate to you an unfortunate and most disquieting experience. It has fallen to my lot on three occasions to injure the vena cavæ in doing a nephrectomy. In the first two cases it was our belief that the accident was unavoidable; the last case, in spite of the care used, my feeling is it should not have occurred, however, the office of this paper is to relate an experience and not to offer an apology or explanation.

Case I.—A woman, aged about fifty years, with a typical history of calculous pyonephrosis extending over a period of about ten years. Her personal and family history previous to the commencement of this trouble, ten years ago, was entirely negative, hence it would be time wasted to recount it. The only thing that ever brought her to seek surgical relief was the appearance, in the right kidney region, of a large tumor, which gradually increased in size until it reached nearly down to McBurney's point; the *x*-ray showed a large stone in the pelvis of the right kidney. She had pain, hamaturia, fever, chills, sweats, and loss of weight, and the urine was loaded with pus. Examination of urine for tubercular bacilli negative. I shall mention one significant and interesting feature in this case which has often been noted before, namely, when the urine was loaded with pus and drainage from the kidney was free there was always a definite recession of symptoms; conversely, when the urine was perfectly clear, then almost invariably would occur an

exacerbation of symptoms, with increase in size of the tumor mass; the explanation, of course, being, in the first instance, a freely draining cavity with lessened absorption, and in the second instance, a ureter obstructed with a mass of kidney debris, preventing any escape of pus but allowing urine from the good kidney to show clear. The examination of urine taken at this time showed it to be practically normal, with a healthy urea output showing a sufficient physiological compensation of the healthy kidney to do double duty.

Operation. As is my preference in cases of this sort, we operate through a long anterior incision, going down to the peritoneum and then reflecting it carefully off of the tumor mass, and when this cannot be done, opening the posterior peritoneum and completely protecting the general cavity from the operation field with gauze pads. After a great deal of trouble, I thought the kidney had been completely freed from its densely inflammatory bed; the pedicle was clamped *en masse,* and ligated. On lifting the kidney out of its bed an undiscovered point of attachment tore into the vena cavæ and an alarming hemorrhage ensued, but having the kidney out of the way, we were able to control the bleeding by the use of two Kelly clamps; a rough estimate would give about one-half of the caliber of vessel occluded. The patient's general condition forbid any effort at either suture or ligation; drains were carefully placed around the forceps and the wound closed up to the point of forceps. To my great surprise this patient, without any noticeable disturbances to the venous circulation in the lower extremity, made a smooth and even recovery, and has remained well.

Case II.—The general history of Case II was so nearly like Case I that we forbear relating it extensively. The patients were of about the same age, same size, both were short-waisted, stout people, and in all other ways were very similar, except that in Case II the left kidney was the one involved. So far as the operation goes, simply transfer the work to the left side instead of the right side, remember-

ing the higher position of this kidney, and you have a situation as nearly alike as two different things can be. The operation on this case was most tedious, and just when we thought things about over, the same accident occured; encouraged by my former experience and being on the look-out for such trouble, the bleeding-point in the vessel was clamped and left. This patient had a very stormy convalescence, some edema of the lower extremities, but she ultimately recovered.

Case III.—The history of Case III will not be interesting to you. Suffice it to say, I was removing a pyonephrotic kidney through the loin (right) incision; on freeing the lower pole of this kidney, which was densely adherent, there occurred a profuse hemorrhage, which, while the kidney was in the way, could not be controlled except by gauze packs. This method, however, was satisfactory until the kidney was removed, and it was found an injured vena cavæ was the cause of the trouble; two large clamps controlled the bleeding and our patient's ultimate recovery was good.

You probably feel by this time, gentlemen, and rightly so, that the title of this paper should read "the awkward blunders of an unskilled man." I have not much liking, however, for the surgeon "who keeps back part of the price" and never has any unpleasant things to report; there may be a few lessons in it for all to learn.

If Albarran, Israel, Clairmont, Cabot, Bottini, Billroth, Kuster, and others can have this accident happen to them, we venture to suggest that others less skilful may suffer the same misfortune.

In the case of malignant disease or in the case of dense and extensive inflammatory disease, especially when the vessels are principally involved, the pathological process may be in a very real sense continuous with the vena cavæ, hence the possibility of accident.

It is interesting to note that both Albarran and Heresco have expressed opinion in favor of complete section and

double ligation as possibly being the best method with which to deal with the accident. Cases mentioned by them in which complete ligation was done with practically no disturbance of circulation is certainly a point to be remembered when operating on malignant disease of the kidney.

In one case the hemorrhage from a torn vena cava was successfully controlled by gauze tamponade (Linder's case, p. 63, Literature).

In all of our cases the clamp alone was used to close the injured vessel wall. Clairmont and Israel have 1 case each, and Cabot, of Boston, has, I think, 2 cases, in which clamps were used, making in all a total of 7 cases in which this method was employed.

In all of our personal cases the clamp was unlocked on the seventh day and removed on the eighth day. (We are not making any plea for clamp, Lubig is best). Finally, we think it well to bear in mind that so serious an accident can be so succesfully met in so simple a way.

ABSTRACTS FROM LITERATURE

Aguilar, J. (*Revist. Soc. Méd.*, Argentina, 1900, viii, 355, reports a successful case of clamping and subsequent ligature of the vena cava which was injured by traction upon the kidney during nephrectomy. The kidney had become infiltrated by a neoplasm (the nature of which is not mentioned), was very adherent to the surrounding parts, and weighed 1400 gms. Patient, female, aged thirty-five years, completely recovered.

LIGATION AND RESECTION OF THE VENA CAVA

Peltesohn, L. (*Inaug. Dissert.*, Emmendingen, 1907). Peltesohn reviews the history of the above, and says that suture of the vein is indicated in those cases in which the tear in the vessel does not exceed a certain extent, and not

too deeply situated to be reached, and was first done by Wattmann in 1823; since then by many others.

Schede[1] reports a case of right-sided carcinoma of the kidney in which the cava was wounded after the pedicle had been cut off. The ensuing copious hemorrhage was controlled by suture of the vessel. The patient died on the eighteenth day from other causes, and the autopsy showed that the suture had remained firm and no thrombi were found at the site of injury. In most cases injury to the cava is accidental, and in only two it was due to pulling upon the parts. These were reported by v. Manteuffel and Giordano, both carcinoma of the kidney, in which the cava was intentionally opened and a portion of its carcinomatous wall removed along with the tumor, and the defect closed by continuous suture. Manteuffel's case was successful, the patient leaving the hospital cured on the twenty-ninth day; Giordano's patient died shortly after. He gives the following table of fourteen cases of ligation:

Operator.	Lesion.	Result.
Bottini	Prevertebral lymphosarcoma.	Recovered.
Houzel.	Pyonephrosis.	Recovered.
Heresco.	Pyelitis-calculus.	Recovered.
Albarran.	Two kidney operations.	Recovered, 1; died, 1.
Hartmann.	Pyonephrosis.	Recovered.
Goldmann.	Pyonephrosis, tubercular.	Died same evening.
Linder.	Renal carcinoma.	Died of air embolism.
Küster.	Renal carcinoma.	Died twenty-six hours later.
Marconi.	Prevertebral lymphosarcoma.	Recovered.
Billroth.	Pyelitis calculus.	Died one and one-half hours later.
Israel.	Hypernephroma, left side.	Died eleven days later.
Clairmont.	Malignant adenoma.	Died four days later.
Turetta.	Gunshot wound.	Died five hours later.

Clairmont and Israel's cases were controlled by the clamp only.

[1] Arch. f. Klin. Chir., 1892.

The writer gives detailed history and operation of his own case, that of a woman, aged twenty years, in which a sarcomatous kidney was successfully removed. The disease had spread to the vena cava and the portion involved was excised and the vein ligated. Although she had considerable pain and fever for several days after the operation, there was absolutely no disturbance of the circulation whatever, and she left the hospital cured. No subsequent history could be obtained, but it is very probable that the disease recurred.

Linder, H.,[1] operated on a man, aged sixty-two years, for carcinoma of the right kidney which had attained the size of an adult head. His general condition was so bad that he was told operation might prove fatal on the table, but he insisted that something be done, as he could no longer endure his sufferings. The kidney was brought out of the abdominal wound and on drawing upon it there was a sudden gush of black blood which was at once recognized as coming from the injured vena cava, an accident which had been anticipated by previous instruction to the assistant to look out for the bloodvessels. The vein was clamped and ligated, but death occurred shortly after completion of operation. Autopsy revealed carcinomatous infiltration of several centimeters of the vena cava, a portion of which had become detached during the manipulation of the kidney involved.

Linder also reports, in the same journal, a case of right-sided pyonephrosis, during the operation for which hemorrhage took place from a tear in the vena cava inferior, to which he applied firm tamponade. The bleeding was controlled, and after much suppuration afterward the patient eventually recovered.

Barnsby, H. (*Congrès Franc. de Chir.*, Paris, 1906, xix, 128). This author reports a case of laceration of the

[1] Münch. med. Woch., 1901, xlviii, 1910.

inferior vena cava during a transperitoneal nephrectomy for cancer of the kidney. Suture of the vein. Recovery.

Male, aged thirty-nine years, having all the classical symptoms of epithelial cancer of the right kidney, and was operated on in August, 1902. Transperitoneal nephrectomy. The tumor was the size of an infant's head. The enucleation was begun at its upper portion by the fingers, and was easily done from above and behind, but very difficult below and in front, on account of its firm adhesions, and in attempting its detachment from the vascular pedicle an immediate, severe gush of black blood set in. A clamp was at once placed over the pedicle, and with one stroke of the scissors the tumor was cut off and compresses of gauze applied, with digital compression by the assistant. It was seen that the anterior wall of the inferior cava had been opened about 8 mm. and above the renal pedicle. Realizing the gravity of the accident, the vena cava was carefully isolated by means of a cannula and two strips of aseptic gauze passed behind the vessel, which was then secured by a row of sutures. After about half an hour all pressure was released and no further hemorrhage followed, and the wound was closed, with drainage. The patient recovered rapidly, without any secondary hemorrhage or acute symptoms of any sort, showing that the permeability of the vena cava was perfectly preserved.

Delanuay (*Congrès Franc. de Chir.*, Paris, 1906, xix, 126), reports a case of ligation of the vena cava in a nephrectomy on a woman, aged forty-eight years, October 22, 1903. A whitish tumor, hard and compact, the size of a fist, involved the kidney, the nature of which was either syphilitic or tubercular. It was firmly adherent and fixed between the intestinal folds on its anterior and internal borders. After freeing the tumor a clamp was placed on the pedicle and then cut off. On removing the clamp in order to replace it by a ligature it was found that the vena cava had been included and incised laterally to the extent of 3 cm. below

the renal vein. He at first thought of suture, but as the operation had been difficult he at once resorted to ligation and tied the vein above and below the lesion. No after-effects were noticed and recovery progressed without any incident. There was some edema, which disappeared entirely on the seventeenth day. The abdominal wall was transversed by large, tortuous veins, more prominent on the right side, as there was more difficulty to reëstablish the circulation on this side, from the abdomen of the collateral utero-ovarian and the reno-azygolumbar branches found on the left side. These abdominal varices had completely disappeared by the following June, and the patient stated that although the menopause had set in two years ago she had a reappearance of the menses, and that from time to time she had passed quite an amount of blood from the bowels. No further history of the case is given, but from the nature of the case, the difficulty in the operation, and the uneventful recovery, he thinks that ligature here was much better adapted than suture.

Treatment of Injury to the Inferior vena cava in Nephrectomy. Dr. Heresco (Bucarest, *Compte-Rendu, Assoc. Franç. d'urolog.*, Paris, 1904, viii, 777). Injury to the inferior vena cava in nephrectomy is a most serious accident for which the surgeon is not to blame, especially when it occurs on the right side, as the lesion is due either to a large pyonephrosis or tumor of the kidney which is directly communicating with the vein. We know, however, that the inferior vena cava can be ligated without any danger to the patient and without producing any functional disturbances, such as edema of the leg, and the writer reported such a case to the Surgical Society of Paris about two years ago. It was that of a woman with a large pyonephrosis from a calculus. In doing a transperitoneal nephrectomy the vena cava was wounded; it was ligated and the patient recovered without showing any circulatory disturbances.

In discussing this case, Albarran spoke of the comparative

advantages between suture and total ligature of the vessel, but said he had not sufficient experience to warrant a preference of either method, but thought that ligature was more efficient, since in most of the cases the neoplasm of the kidney extended into the vein itself.

The writer has since then had occasion to agree with Albarran on this point in the following case of malignant neoplasm of the pelvis, with numerous large ganglia of the hilus, involving the vena cava and extending into the aorta.

Male, aged thirty-five years, was admitted with severe hematuria, which began five weeks ago. The hemorrhage was spontaneous and was not influenced either by bodily movement or at rest and was not accompanied by pain in the bladder or lumbar region. The ureter was free, the bladder when distended had a capacity of 240 c.c.; the prostate was normal. The right kidney was enlarged and movable, the left could not be palpated. Urine showed a purulent deposit. Lithiasis was thought of, but the diagnosis of renal tumor or tuberculosis was more probable, especially the latter, owing to his bad general condition and the fact of his having two fistulas in the neighborhood of the left coxofemoral articularion dating from an old coxalgia. He also gave a history of pleurisy following an accident five years previously. Repeated examination of the urine failed to reveal Koch's bacilli; the urea was diminished to 6 gm. per liter, and the quantity of urine passed in twenty-four hours was 1250 gm. The function of the left kidney seemed normal as tested by methylene-blue.

On lumbar incision the enlarged kidney appeared healthy on the surface, but the pelvis was indurated and distended. Numerous ganglia surrounded the vena cava of such hardness as to leave no doubt of their neoplasmic nature, and were so firmly adherent that their removal was impossible. Two of these were situated between the cava and the aorta, and during their manipulation severe hemorrhage occurred from the vein at a point where the wall had become involved.

As the mass could not be ablated the wounded vessel was sutured and the hemorrhage ceased. The kidney was then removed, the muscles and skin sutured, with drainage by two sterile compresses. Death in eighteen hours afterward.

Autopsy showed that the suture held firmly, but about 3 cm. above it a ganglionic mass had ulcerated and penetrated the vein, a thrombus had formed, and this with the embolic portion had caused sudden death. Section of the kidney revealed a carcinoma infiltrating the pelvic portion.

Injury to the Vena Cava during Nephrectomy. Sagols, I. (*Thèse,* Montpellier, 1903). The writer described the following cases he collected.

1. Lucke (*Deutsch. Zeitschr. f. Chir.,* 1880, xv, 514). Sarcoma of the kidney. Nephrectomy. Injury to vena cava. Died from uremia.

Male, with diagnosis of sarcoma but it was difficult, to decide whether or not the kidney involved was a movable one. On median incision the tumor, which was very movable, was enucleated with the fingers, without much loss of blood. The hilum was then sought for and an attempt made to isolate it in order to include it in a silk ligature. While the tumor, which was very smooth and slippery, was drawn upward in order to apply the ligature, it suddenly tore away and fell to the floor. Immediately a flood of dark blood filled the abdominal cavity. The wound was at once packed with gauze sponges and pressure brought to bear with the hands. Pulse and respiration did not change. Compression was continued for a few minutes, and then the strips were cautiously withdrawn one after the other. A cord of tissue several centimeters in length could be felt, and after being grasped in clamps the hemorrhage ceased. Death on the fourth day.

2. Helferich (*Virchows Arch.*). Cellulostriated fibromyoma of the renal capsule.

Female, aged fifty-seven years; removed the right kidney. The ascending vena cava was torn, the resulting rent closed

by a ligature. The patient hardly voided a few cubic centimeters of urine after operation, and death occurred two days later. At autopsy no metastases could be discovered in the other organs; the left kidney was normal.

3. v. Manteuffel (reference not given).

Male, aged forty-nine years, extirpation of carcinomatous kidney; resection of portion involved by the disease and suture of the vena cava. Recovered completely by thirty-ninth day.

4. Bottini (*Clinica Chir.*, 1892, No. 12, 529).

Female, aged forty years; extirpation of a voluminous prevertebral lymphosarcoma; the right kidney was not involved, but had become atrophied from pressure by the growth. The vena cava had been torn and was ligated. Complete recovery.

Injuries of the Vena Cava during Operations upon the Kidney and Their Surgical Treatment. Cathelin and Uteau (*Rev. Prat. d. Mal. d. Organ Genito-Urin.*, Lille, 1908-09, v, 398, and 1909-10, vi, 1). The following cases of nephrectomy collected by the writer are abstracted from his article.

1. Billroth (*Wein. klin. Woch.*, 1885, p. 1012). Contribution to the casuistic of nephrectomy.

Female, aged forty-two years. During abdominal nephrectomy for calculous pyelonephritis the vena cava was wounded while cutting off the pedicle of the tumor, and the patient at once collapsed from the ensuing hemorrhage. The vein was clamped, tampon applied, and two silk ligatures placed above and below the site of injury and one behind it. Patient died one and one-half hours after.

2. G. Houzel (*Rev. d. Chir.*, Paris, 1903, No. 4). Injury of inferior vena cava during nephrectomy for a large pyonephrosis. Ligature. Recovery.

Female, aged thirty-six years. Trouble began two years ago. Last year about three liters of fetid pus were removed by aspiration, but the tumor increased until operation was

deemed necessary. In trying to free the adhesions, traction was made upon the growth, which was at once followed by deep-seated hemorrhages, which was found to come from a rent 1 cm. in length from the inferior vena cava. Two clamps were applied and the vein secured by two catgut ligatures; the renal veins and artery were also tied and the diseased kidney removed, which was of the size of a child's head, but had lost all resemblance to a kidney. She made an uncomplicated recovery, with but slight edema, and was completely well in six weeks.

3. H. Hartmann (*Bull. et Mém. Soc. Chir.*, Paris, 1904, xxx, 57). Injury of inferior vena cava during abdominal nephrectomy. Ligatures above and below. Recovery without incident.

Female, aged fifty-six years. Came to operation November 23, 1903, for a voluminous solid pyonephrosis. While freeing the mass by the anterior transperitoneal method the vena cava was wounded at its right lateral border to the extent of 3 cm. Digital compression over the surface of the wound arrested the hemorrhage, and it was found that the tear was longitudinal and 3 cm. from the pedicle of the kidney. The vessel was secured by ligature. Patient made an uneventful recovery, except slight swelling over malleolli, more noticeable toward evening.

4. Schede (*Arch. f. Klin. Chir.*, 1892, xliii, 338). Injury to inferior vena cava during nephrectomy. Lateral suture. Death eighteen days later.

Male, aged forty-eight years. At fifteen years of age had nephritis, and during August, 1887, upon the occasion of a fall, he had violent pain in the right renal region, followed by hematuria, which continued more or less up to time of operation. A rounded, large, and solid tumor was found on the right side behind the ascending colon. Incision 20 cm. parallel to the twelfth rib was made, starting from the anterior border of the sacrolumbar mass of muscles. When the tumor was exposed another incision had to be made in

order to resect the twelfth rib, which was required by the size of the neoplasm. The peritoneum was then incised and the tumor freed by the hand. The pedicle was found so short that the vessels of the hilum could not be ligated separately, and was included in an elastic ligature and the tumor cut away. As he did not wish to leave a lateral ligature on the vena cava, the vessel was compressed above and below the point of ligature, and the latter being then removed, attempt was made to again free the walls of the vessel, resulting in very severe hemorrhage from the left renal vein. With two clamps, whose ends met at the middle of the vessel, the solution of continuity was closed and the bleeding stopped. What still remained of the tumor could now be removed, and it was found there was a rent of 20 mm. in length in the vena cava. This was closed by catgut sutures, after which the clamps were removed. Hemorrhage had completely ceased and perfect permeability of the vein was noted. For the first few days he did well, but rapidly declined and died suddenly. Autopsy showed that death was due to acute fatty degeneration of the heart and other organs, but the condition of the inferior vena cava was interesting. On incision it was found filled with fluid blood, as well as the left renal vein. Opposite the left renal vein, at a point where the right renal vein should enter, a cicatrix was distinctly seen. It had the form of an arc, with only a slight convexity about 2 cm. in length, and formed a projection into the lumen of the vena cava, which slightly obstructed its lumen; this narrowing, although quite marked, did not seem to hinder the circulation. At the point of cicatrization, both the external and internal layers of the vessel were completely and solidly adherent, the internal layer was intact, and there were no signs of formation of a thrombus.

Of the 20 cases mentioned by the authors in this paper, operation was done for cancer in 10, for pyonephrosis with adhesions in 7, for calculus in 2, and for kidney stump with fistula from previous operation in 1.

Results of ligature, 4 recoveries, 4 deaths = 8 cases; results of suture, 2 recoveries, 3 deaths=5 cases; results of resection, 2 recoveries, 3 deaths=5 cases; 1 death from clamp; 1 death from tampon=2 cases. Total, 20 cases, with 8 recoveries and 12 deaths, 10 of which were immediate to operation.

Two Cases of Injury to the Vena Cava during the Removal of Pyelonephritic Kidneys. A. T. Cabot, (*Boston Med. and Surg. Jour.*, 1912, clxvii, 578).

1. Female, aged thirty-five years. Operation. Kidney very adherent over upper, inner, and posterior parts. Large veins in its posterior wall. These were clamped and separated from the capsule. After the sac was removed it was found that one of these large veins was the collapsed vena cava. It had a rent in its wall where the renal vein had been separated. This was closed by two silk stitches. The adhesion of the sac was so close and firm that a considerable portion of the peritoneum came away upon it. This was closed with chromic gut, but beneath the liver there was a gap of about two inches where it could not be brought together. Wicks were so placed as to prevent the escape of the bowel through this aperture, and after the wound was closed a tight binder was put on to hold the deep parts in close apposition. Recovery.

2. Female. Operation. By a long incision from the rib down to the outer border of the erector spinæ muscle the tumor was reached, the trocar was introduced, and about one and one-half quarts of thin creamy pus was withdrawn. This left a large, flabby, collapsed sac with little appearance of kidney substance upon it. It seemed as if its removal ought to be easy, and it shelled out without much difficulty until the inner posterior aspect was reached, where it was found firmly adherent to the psoas muscles and the great vessels, making the separation with the fingers difficult. This was done as carefully as possible, but had to be done without the aid of the eye, as it was high up and behind the sac.

There was considerable oozing, which was stopped by packing When the tumor was finally freed with difficulty and lifted out of the wound, what appeared to be the pedicle was found to contain no vessels, only fatty tissue, which was tied and separated and the kidney lifted out. On removing the gauze packing there was extensive venous hemorrhage in the depth of the wound. Pressure was made with the fingers and the gauzes removed, when it was found that the hemorrhage occurred from a couple of small openings in the side of the vena cava, apparently where the renal veins had been torn across in removing the tumor. These were clamped and an attempt was made to suture the opening in the depth of the wound, but the patient's condition made this impossible. Clamps were therefore placed on the vena cava, and when these were in position so as to control the hemorrhage they included about half of that vessel. The wound was closed with large drainage wicks down alongside of the clamps and a large dressing was applied so as to protect the handles of the clamps from pressure. Patient was much exsanguinated, and saline infusion was necessary. At the end of a week the clamps were removed from the vena cava, and from this on slow and steady progress to recovery.

An interesting feature was the ease with which the wound of the vena cava was closed, in the first case, where with a thin-walled abdomen the parts could be brought readily into sight, and how great the difficulty, on the other hand, in the second case, where we had thick dorsal muscles and a stout abdominal wall. Also, it was interesting to note how in Case 2 with clamps including a large part of the wall of the vein, Nature succeeded in forming a cicatrix which adequately held the vessel when the clamps came away.

DISCUSSION

Dr. Guy Le roy Hunner, of Baltimore, Maryland.—I am sure the Association is greatly indebted to Dr. Guerry for the splendid presentation of a subject which involves such a serious condition at times. It is well worth while to have repeated every now and then the various methods of getting out of a bad scrape successfully, because sooner or later we are bound to get into trouble if we are doing much work along these lines. This is particularly so in kidney surgery.

Personally, I have had the good fortune never to have injured the inferior cava in kidney surgery. I consider it good fortune rather than good management. In removing a large hypernephroma, or an immense pyonephrotic stone kidney, I have always expected to meet my Waterloo. I have in some cases had hemorrhage from allowing a slipping of the renal artery or the vein in this region, and I wish to emphasize a very simple but important point. In dealing with such hemorrhages down in a deep hole, especially if the kidney has not yet been removed, we should not use clamps indiscriminately. The best method I have found in dealing with these obscured hemorrhages is to introduce the hand in all cases or the finger, or better thumb and finger, if the bleeding occurs in such a position that we can do that. Ordinarily by catching the bleeding-point immediately by finger or thumb and finger pressure we can use gauze points, clean up the wound, and have perfect control of the field for clamping or suturing, whichever way seems to be the best for dealing with the bleeding-point. I think that some of these injuries come from the blind grabbing with forceps in a hole where nothing can be seen and the real bleeding point is obscured by the fresh blood.

Occasionally in removing the uterus for carcinoma we strike some large vaginal veins, and cannot tell from which direction they are bleeding, and the best method is to use finger pressure until you can sponge about and get a good view of the field before you begin to clamp; otherwise you injure the ureter or tear some of the veins or get into worse trouble and have finally to clamp blindly and leave the clamps on.

Dr. Hubert A. Royster, of Raleigh, North Carolina.—Instead of apologizing for failures, Dr. Guerry is to be congratulated on three brilliant successes. About three weeks ago

I was talking to Dr. Guerry about this question, and I said I never had such an accident, and that I did not see how it could happen in a well-regulated family, but a week after that I had one and it came from just such conditions to which Dr. Hunner referred. I was doing a nephrectomy through an anterior incision in a woman who also had gall-stones. The kidney was one of those tuberculous miliary cases with involvement of the pelvis and of the ureter. The organ was normal in size. In lifting up the kidney in the manner Dr. Guerry has described there was an attachment and the renal vein was pulled off. In attempting to get at it I grabbed a pair of forceps quickly, went down where I saw the bleeding vessel, and instead of getting the renal vein or artery, I caught the vena cava below with a pair of Ochsner forceps, and tore the vessel. With another pair of clamps I held it until I put in a double mattress suture, and controlled the hemorrhage. I then secured the renal vein and ligated it.

It occurs to me that this accident is less liable to happen when one does an intracapsular nephrectomy than if one goes to the outside, because we cannot get quite so far down when we cut through the capsule and reflect it. From personal observation in Zuckerkandl's clinic, I find they do a nephrectomy by the intracapsular method always in stone and inflammatory cases, and also in the tuberculous and tumor cases, if the capsule itself is not involved. It occurred to me to make just this point, that we are less liable to injure the vena cava when we remove the kidney by the intracapsular method.

Dr. I. S. Stone, of Washington, D. C.—I have had two accidents, one to the axillary vein and one to the renal vein. They were partially torn. These accidents are occasionally handled without having to tie either large vessel. We have here a vein which is pulled upon at some point in some way, and partially torn from the main trunk. In one of my cases if forceps had been taken away the accident would not have occurred, for an ambitious assistant tore the vein at this point by making traction upon it (indicating by diagram); the hemorrhage occurred in full view. I attempted to suture the vena cava by drawing the vein over and covering in the defect, but I was afraid there would be continued hemorrhage, and found it comparatively easy after the sutures were drawn together, that I could get a ligature around the whole mass, which stopped the hemorrhage, and both patients recovered without the least

difficulty. In neither case was it necessary to occlude the large vein.

Dr. Gordon K. Dickinson, of Jersey City, New Jersey (by invitation).—I think it takes more nerve to get up and talk before the members of this Association than to repair the vena cava after it is cut. In removing a hypernephroma I accidentally went into the vena cava, was thoroughly frightened, but the pressure was so light that very little compression with the finger controlled the bleeding. Treat a bloodvessel as you would treat an intestine; don't worry; keep your nerve; pass a few ligatures and there will be no trouble whatever. You can suture the vena cava, as the Doctor has told you, easily, simply, and quickly. With reference to hyperplasia of tissue. I intentionally run my bistoury down into the vena cava, to prove it is there, not knowing whether I have it or not. I obtain my landmarks, and in connection with subsequent dissection I can suture and have less bleeding from the vein.

Dr. A. C. Scott, of Temple, Texas.—I have been very much interested in the paper of Dr. Guerry, and I think it is a very valuable one. It has given us some food for thought.

Having had some accidents with large veins on more than one occasion, I of course feel more deeply interested in the subject than I would otherwise be. In regard to the matter of handling accidents of this kind, the Doctor did not mention a procedure which came very handy to me in one case where I had such an unfortunate accident. I may say, by the way, I had it occur in one case in connection with the removal of the kidney, and in but one case did I have it occur in the vena cava. Having had the same accident with the femoral vein just below Poupart's ligament, I want to mention that I did not feel quite so badly as I would have felt if this was my first accident. During an attempt at removal of a pancreatic cyst about the size of a large apple, not having an experience of that kind before, and it being a rare thing, I undertook to dissect out the pancreatic cyst, and while working along the inner lower border of it in contact with the vena cava, a number of hemostats were on the pancreas and my assistant was drawing up very firmly, I presume, and as an operator will occasionally do, I attempted to assist the assistant, and by the added traction which was already being made upon the cyst at the point where it was closely attached to the vena cava, I suddenly tore a large hole in the vessel. It was not the fault of my assistant. I had

no business to take hold of the forceps with which he was making traction.

The last speaker said there is no occasion to be worried or afraid of these things. Fortunately I did not get frightened. I did not know whether I could stitch it or not; I undertook to stitch it and succeeded. I did not stitch it as accurately as I did the femoral vein, but I tried to utilize a flap from the pancreas itself, just a small portion of the pancreas pulled up next to the point, and when I put in my sutures, in tying them down, I just laid over this a piece of pancreatic tissue, and in that way I avoided the necessity of having to put in quite a lot of sutures. The patient had no further bleeding from it. I reported this case to one of our local medical societies.

An interesting feature occurred in connection with that case I might mention, and that is, soon after I had an alarming hemorrhage from the wound in the vena cava, I gave up the idea of removing the pancreatic cyst, so I resected it. It was stand-up there; I had a rupture of the cyst, I resected it all the way around, leaving a small cuff, so to speak, and in doing so I had to transfix to control hemorrhage and finally packed it full of gauze, I drained it directly, drainage was removed in two days, and the patient had no untoward symptoms, making a nice recovery.

Dr. Richard A. Barr, of Nashville, Tennessee.—There was one technical point brought out in the discussion I want to speak of, and it was mentioned by Dr. Royster, who made the statement that the accident might be avoided by doing a subcapsular nephrectomy. I think Dr. Guerry reported eleven cases out of a series of twenty-two in which the injury occurred in the operation for the removal of the stump of kidney left by previous nephrectomy. It seems to me the suggestion of Dr. Royster would be likely to hasten rather than obviate injury to the vena cava. Leaving the capsule of the kidney would be the one thing most likely to necessitate a second operation for the removal of the pedicle left behind, unless one could shift the second operation to the next man, and so avoid personally doing injury to the vena cava, but I do not know that that would be in any way advantageous. The suggestion of leaving the capsule of the kidney in tuberculous processes, unless we can demonstrate actual tubercular involvement of the capsule, is, it seems to me, a dangerous proposition. I believe the kidney should be removed with its capsule, and

I do not believe we would ultimately avoid injuries to the vena cava by leaving the capsule behind.

Dr. J. M. T. Finney, of Baltimore, Maryland.—Just how serious this condition may be is illustrated by one of the cases reported by Dr. Guerry. It is one of Dr. Cabot's cases of Boston. At that time I was a health officer in the Massachusetts General Hospital, and assisting him in this particular operation, and I shall never forget the impression made upon me. It was a particularly unfortunate case, in that this patient had been operated upon previously for the removal of a fibroid, and at that operation by another operator one of the ureters had been cut, leaving a urinary fistula. For the relief of this fistula this operation was being performed by Dr. Cabot. It developed subsequently at the autopsy, and in comparing the specimen at the same time, that this patient had an abnormally short renal vein, and in ligating the kidney the ligature had included the lateral wall of the vena cava, and when the pedicle was cut the wall was simply inverted, and a few moments after the kidney had been removed there was a gush of blood such as I have never seen before or since, and I hope I never will see again. Dr. Cabot instantly attempted to pick up the bleeding-point, and succeeded after a little while with a pair of forceps, and after cleaning out the wound found he had clamped the full caliber of the vena cava. This was a good many years ago, and at that time it was deemed best not to attempt to do more than leave on the clamp. The patient had lost so much blood during the time he began to pick up the bleeding-point that she succumbed in a very few minutes; in fact, she died on the table.

I simply mention this case as an illustration of the fact that this accident is really a serious one. Opening the vena cava has more to it perhaps than some of us are inclined to believe.

Dr. Francis Reder, of St. Louis, Missouri.—I was very much interested in the case related by Dr. Finney. I had the misfortune of opening the vena cava; fortunately the patient recovered. A clamp was applied to the wound in the vessel for the purpose of controlling the hemorrhage. Such accidents must be looked upon as serious in the extreme, they spell "caution" for the surgeon when he works in a crowded space. A point I wish to emphasize is this: As soon as I reach what can be interpreted as within dangerous territory, I introduce a ligature, double thread it, upon a small round needle full curve, in the bed of the kidney corresponding to the lower pole

and secure it. An additional double-threaded needle is introduced into the bed of the kidney corresponding to the upper pole. The tissues are clamped, cut, and whipped over with this susture. This process is continued from below up and from above down until the pedicle is reached. Traction on the sutures will be of appreciable worth. The pedicle is securely clamped, and the diseased kidney ablated. The ureter is demonstrated, cauterized if necessary, and ligated separately. Frequently this step is not carried out. The sutures upon the needle can here be used to splendid advantage by sewing over the stump and tying the upper and lower ends together over the stump of the pedicle. With this procedure the loss of blood is very small. Frequently I have not found it necessary to separately ligate the renal vessels.

Dr. Francis R. Hagner, of Washington, D. C.—I wish to congratulate Dr. Guerry on his results in these cases. He has been fortunate indeed. Luckily, I have not had one of these cases, but have had two where a vein close to the vena cava slipped out of the forceps. In such an accident, the first thing to do is to get the kidney out at once, as it is then possible to locate the bleeding and apply the clamp more readily.

Hemorrhage of venous origin is more difficult to clamp than arterial bleeding as the welling up of blood obscures the point of hemorrhage. It has always seemed to me that hemorrhage of this character is as alarming as any that occurs in surgery.

Dr. V. P. Blair, of St. Louis, Missouri.—If one made a resection of the vein at the site of entrance to one of the renal veins, what would happen to the other renal vein?

Dr. Guerry (closing the discussion).—I should feel very sorry if the impression went out from this Association that this accident is a matter of no consequence, because as I conceive it it is unfair and is a one-sided view of the situation. We must not simply take into consideration injury of the vena cava; we must consider the seriousness of this accident in its relation to the magnitude and seriousness of the operation that we may be performing. As a matter of fact, in the cases we have been able to get access to the authors give the exact figures. In the first series of cases involving the pelvic zone of fourteen cases there were eight deaths. That is a tremendous mortality in which this accident has occurred. When we consider the mortality of injuring the vein itself, not working under ideal conditions and injuring the vein itself, the mortality

necessarily depends upon the magnitude of the operation. In the last series of twenty cases there were eight recoveries and twelve deaths. Think of that! Ten of them immediate to operation. If we let the impression go out from this Association that this accident is such a simple thing, the mushroom surgeon will be doing all sorts of things that he has no business to do.

In reference to the remarks made by Dr. Royster, there was only one case to which they would apply, and the same may be said with reference to the remarks made by Dr. Barr.

As to the question of Dr. Blair, there is no mention made of the condition he speaks of in the literature. It is referred to as resection and double ligation of the vena cava.

CHOICE OF OPERATIONS FOR RETROVERSION WHEN THE ABDOMINAL CAVITY IS OPENED

By Henry T. Byford, M.D.
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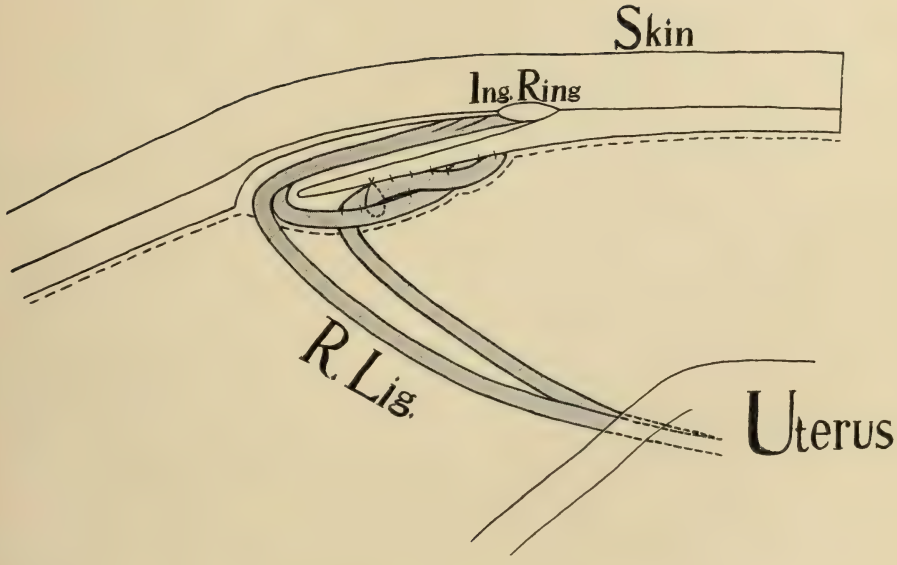
Theoretically, I consider Alexander's operation for shortening the round ligament the operation of choice for retroversion, because it preserves the normal relation of the uterus to its surroundings. Practically, I consider it so because it usually accomplishes its object in a satisfactory manner; it has stood the test of time. But when a suprapubic abdominal incision must be made, it is often possible to minimize traumatism and save time by correcting the displacement through such an incision. Under these circumstances an operation upon the sacro-uterine ligaments is theoretically the one of choice. In practice, however, operations upon the round ligaments have been found to be more satisfactory, and I will limit myself to a consideration of the latter only.

In doing so I have nothing new and original to propose. When original operations prove to be successful they are usually found to be merely improvements upon operations or procedures already known to the originator, but forgotten or unrecognized by the profession in general. Even the creation of man was nothing new and original, it was merely an improvement upon the ape. Realizing this fact, it is my custom when I imagine a really new and original operation that cannot be tried out upon animals, to lay aside



Showing the direction of the normal ligament into the internal inguinal ring, and the shortened ligament folded and attached to the abdominal wall near the internal ring. The dotted line represents the peritoneum.

the project for a few years in order to allow my enthusiasm to subside before I decide whether it is worthy of a trial or not. My justification has been that I have lived to see some of my new and original conceptions conceived anew and given to the world by others, only to die before long an obscure but natural death. It is human to err, and men of fearless originality are usually human. Judgment and restraint are just as essential to successful invention as is imagination and promotion. Without them invention merely consists in trying things and depending upon chance whether the result will be good or bad, or part good and part bad, and should be confined to laboratory work. Hence in planning an improved method of shortening the round ligaments I have tried to profit by the known results of work done by others as well as of my own, particularly with regard to avoiding the things that should not be done, rather than try something new because it is different.

As Alexander's operation utilizes the round ligaments in a natural way by drawing toward the internal inguinal ring, so the intraperitoneal shortening should draw in the same direction. It should also preserve the normal uterine attachment and best part of the ligament. It should not change the relation of the uterus to its surroundings. The relief should be permanent and not be nullified by post-operative complications.

There are certain objectionable features that should be avoided, viz, dependence upon peritoneal adhesions, for they are unreliable; the production of exudates, for they interfere with normal mobility and are apt to produce symptoms; the leaving of exposed sutures in the peritoneal cavity, for they give rise to exudates and adhesions; the suturing of the uterine body in any way, for it frequently interferes with normal function; traction in an upward direction, for it should, as far as possible, be downward upon the filling and emptying bladder.

I believe that none of the methods that have been recom-

mended for intraperitoneal shortening of the round ligaments fulfil all of these requirements, and that all of them give rise to one or more objectionable features.

I will not waste your valuable time in describing the proposed method in detail, but will merely give the steps in their natural order.

Grasp the ligament near its exit from the internal inguinal ring and pull toward the median line until it is taut. Pass a slender twenty-day catgut thread through it about a centimeter from the internal ring and again about 5 cm. from its uterine attachment and tie it. Sew the edges of the resulting loop of ligament so that it will form a double cord and leave the end of the thread projecting beyond its free end. Separate the peritoneum freely from the abdominal wall at the lower end of the incision laterally, as far as the internal inguinal ring. With the point of a pair of slightly curved hemostatic forceps, puncture the peritoneum from without inward about a centimeter mesially from the ring, grasp the thread and pull the loop through the puncture until all of the sutures are extraperitoneal. With a permanent suture attach the loop at a point about 1 cm. from its base to the under surface of the abdominal wall as near the inner ring and as low down as possible, without risk of puncturing the epigastric or femoral artery. The pulsating arteries are easily felt, and each step of the operation should be guided both by sight and touch. Twist the loop half-way around on its long axis and sew it with catgut along the abdominal wall toward the median line. Do the same on the opposite side with the other ligament and close the abdomen. Introduce a small pessary to be worn for about three months.

When the operation is done in this way the sutures are all extraperitoneal, the intraperitoneal relation of parts is practically normal, and the traction of the ligament is toward the internal inguinal ring.

I am, of course, careful not to interfere with the circula-

tion of the ligament by including too much of it in the sutures or by twisting it too much. For descriptive purposes I have completed one side at a time, but in operating it is sometimes better to make the loop on both sides before drawing them through the peritoneal punctures, to see if the proper amount of shortening has been obtained. The free separation of the parietal peritoneum is practically bloodless, and the abdominal pressure holds the parts firmly in apposition afterward.

An advantage of this method is that in case the permanent suture should gradually cut through the ligament, then the adherent subperitoneal connective tissue about the loop or cord would yield sufficiently to prevent the ligament being torn out of it, and would afford an elastic subperitoneal attachment that would still exert forward traction. It would afford better support than the peritoneal bands that sometimes result from abdominal fixation and would prevent a complete failure of the operation.

In conclusion, I will say that the operation is simple and easily performed, and consists essentially in attaching the distal end of the shortened round ligament extraperitoneally as near as possible to the internal inguinal ring. Excepting the abdominal incision there is no cutting, and no dissolution of continuity in the tissues other than the blunt separation of the peritoneum from the abdominal walls over a very limited space.

DISCUSSION

Dr. R. C. Coffey, of Portland, Oregon.—In the first place, I would like to say that I challenge any one to point out any other ligament in the abdomen that is for suspensory supporting purposes than the peritoneum. In the second place, I will challenge anyone to show in any other part of the animal organism a place where muscle fibers are developed that are not intended for muscular action. The function of the round ligament in my opinion has been wrongfully used. It is made

of muscle fibers, and some of our best authorities on anatomy state that these muscle fibers are apparently an extension of the fibers of the uterine wall. What are these fibers there for? We find no other place in the animal economy in which muscle fibers are developed except for the effect of contraction and producing motion. Is this an exception to all the principles Nature has laid down? Possibly it is, but I believe it is for the purpose of automatically poising the uterus on its broad ligaments or peritoneal supports.

Much criticism has been made of the Kelly operation for holding the uterus in position. The Kelly operation in which two or three sutures are used to fasten the uterus to the abdominal wall almost never fails to hold the organ in position. There must be a fault in technique if it does not hold. It is the fact of fastening a movable organ to a fixed point that is objectionable. I contend that any operation that has stood the test of time in some way utilize the peritoneum. The Kelly operation depends entirely upon the peritoneum. The operations we studied some years ago that have been most popular, the Gilliam, Webster, and operations of that kind, utilized the anterior peritoneal fold of the broad ligament, and they are the types of operations which have stood the test of time and have been universally used. The Kelly operation should be included among them. In 90 per cent. of the cases in which some one of these operations is done the peritoneum has been used. The peritoneum is the only ligament Nature has used for the purpose of suspending an organ in the abdomen. We can hold up the liver, we can hold up the stomach, or any of the organs with peritoneum. They do not give way, as Dr. Byford contends. He thinks these methods are unreliable. Many of you doubtless remember the operation which I devised some years ago. I have proved since that the round ligament by contraction frees itself under the peritoneum and afterward does not act as a ligament but as an involuntary muscle to poise the uterus. The broad ligament does all the suspensory holding in all cases we have seen afterward.

I have not much faith in any man who says that he has had so many thousands of cases without failure. But at the risk of having statistics question I wish to state that, we have used the method in from three to four hundred cases, and if there is any one of our cases in which the uterus has fallen back after plication of the broad ligaments, some one else has gotten the

case and has not reported it to me. A colleague has done one hundred and fifty by the same method. He claims he has not had a failure, and he does not consider any other operation at all. It is purely a peritoneal operation, that is, we use the round ligament simply as an incident or as a land mark.

Dr. Crile told me the other day, and wrote me sometime ago, he had practically quit every other form of operation. He had tried them out side by side, and was now doing this peritoneal operation. Dr. Clark, of Philadelphia, has practically discarded other operations for this peritoneal operation. When I was in Philadelphia two years ago he was using it almost entirely. No man who has ever taken it up and has used it in as many as twenty-five cases, has dropped it and gone to any other operation. That of itself is good evidence that a peritoneal operation, including the anterior fold of the broad ligament, is quite a successful one.

Dr. John Wesley Long, of Greensboro, North Carolina.—I do not know of any subject that will evoke more discussion than the methods of dealing with retrodeviations of the uterus. In the first place, I want to say that I believe Dr. Byford is working along the right line, and I repudiate as being unsurgical any operation that shortens the uterine end of the round ligaments. It is unnecessary to go into the argument for using the other end, since Dr. Byford has set this before you very clearly. Nobody says that the Alexander operation is not ideal, when we do not have occasion to open the abdomen, Farther, it deals entirely with the round ligament and not with the peritoneum. We have other ligaments, as the utero-sacral, composed of peritoneum and muscular fibers. Why is it that the round ligaments have nothing to do with holding the fundus forward? They are attached to the cornua and pass over to the brim of the pelvis a little anterior to the plane of the uterine fundus. I believe the round ligaments do act as guy-ropes.

Some eight years I devised an operation very similar to the one described by Dr. Byford, and is applicable whenever it is necessary to enter the abdominal cavity. After opening the abdomen I separate the peritoneum from the overlying tissues until I come upon the round ligament outside the peritoneum. Catching the round ligament at this point with a pair of forceps I strip the peritoneum backward until I take up as much slack from the ligament as is desired, then suture the redundant loop to the more substantial tissues of the conjoined tendon.

I read a paper on this subject before the North Carolina Medical Society in 1907, and my friend, Dr. H. A. Kelly, in discussing the paper, said that one of his assistants undertook to count the various operations devised for overcoming uterine retrodeviations; after counting fifty-seven methods, he had quit the game.

Referring to Dr. Kelly's method, I understood Dr. Coffey to say that it does not hold the uterus.

Dr. Coffey.—I did not say that.

Dr. Long.—What then is your objection to the Kelly operation?

Dr. Coffey.—I said the Kelly operation rarely failed to hold the uterus in position.

Dr. Long.—My own objection to it is that it does hold the uterus. I would say further, and I have the words of Dr. Kelly for so stating, that the reason he has abandoned the operation is that in child-bearing women it is dangerous. Any operation that anchors the fundus to the anterior abdominal wall is a dangerous procedure in a child-bearing woman.

If I may have a piece of chalk, I will show you a still better operation which I devised and am doing for retrodeviation. Remember, you want always to do the simplest thing possible. Here is the pelvic wall (indicating), here the fundus, the round ligament passing between these two points. Gauging with the eye the amount of shortening desired, the ligament is seized with a pair of forceps and made taut, which brings the ligament from where it crosses the obliterated hypogastric artery to the point held by the forceps out in bold relief. A curved needle armed with linen is passed through the round ligament close to the pelvic brim (indicating): without tying, the needle is again thrust through the round ligament a quarter of an inch nearer to the forceps. This is repeated again and again until sufficient slack will be taken up, when the ends of the linen are tied together. This "flutes," and shortens the sutured portion of the ligament. You see we have secured not only the muscular portion of the ligament but the peritoneum as well, so have both tissues at work, holding the fundus in its normal position.

Someone objected to leaving a suture knot inside the peritoneal cavity. This is easily avoided by picking up the peritoneum on either side and passing the needle through in a reverse direction (indicating), which brings two little folds of peritoneum over the immediate field of operation, hiding from

view the suture and convoluted round ligament, at the same time putting them out of reach of the meddlesome intestines.

Dr. Herman J. Boldt, of New York City.—I believe Dr. Byford dealt only with retrodisplacement of the uterus where the abdomen was opened, if I understood him correctly. I believe that retrodisplacement should invariably only be dealt with when the abdomen is opened, because the great majority of cases of retrodisplacement do not cause any symptoms whatever, and I feel very much the same as I did toward an operator who some years ago cited nearly two hundred vaginal operations for retrodisplacements that he had done in a period extending over two or three years. I felt that this gentlemen had operated on every woman who had a little displacement of the uterus. The greater number of women who have retrodisplacement of the uterus have no symptoms unless there be complications, and the retrodisplacement, unless it is fixed posteriorly, in the majority of cases may be relieved entirely from its mechanical effects by a properly fitting pessary or mechanical support. It is unnecessary to operate upon very many of these cases, but when the abdomen is open, as Dr. Byford has said, then I believe one should deal with that class of patients, so that these women should not be subjected to the necessity of any mechanical support. It does not make a particle of difference what method is used, there are so many roads that lead to Rome, and every operation devised is the best operation in that particular operator's hands, and there is no question but what each gentleman is able to show good results from his particular method. Most of us, when we devise an operation and have done it several times think it is the thing. The particular methods of Drs. Coffey and Long are followed by excellent results in their hands, whereas they perhaps would not be considered so in the hands of other operators. I would not say that any one method is the only method to use. I feel, however, that there is no necessity of doing an operation for the greater number of cases of retrodisplacement of the uterus. It is only in that class of retroversions where the abdomen is opened for other purposes. That is the class we should operate upon.

Dr. I. S. Stone, of Washington, D. C.—I am quite sure that Dr. Byford's paper is along correct lines, that it is a very great advance, but I am not afraid to go through the abdominal wall. He is correct in principle, and the rest of the fellows are

a little off, by the way. His principle is correct in utilizing the better part of the ligament, and I am not going to make my remarks for the purpose of trying to improve on what he has shown here. Notwithstanding what Dr. Coffey says or anybody else says about the muscular part, if he will make a small skin incision over the inner ring and will uncover the round ligament, and will draw it through the abdominal wall at that point, and secure it as Dr. Gilliam does, he will have as good an operation as any one can use. I have tried many times to give added support to my work by inserting sutures a little after the manner of Dr. Byford, but I fear intra-abdominal pressure will draw heavily upon the sutures which he has placed outside the peritoneum on the abdominal wall. If you put the ligaments quite through, there is but little additional traumatism. Use a catgut loop through the ligament, uncover the round ligament or scarify its peritoneal cover; force it through at the inner ring, and suture it after the Gilliam method, and you will often find it is the best operation you can possibly use, and personally I consider it the best I have seen recommended of late years.

However, I recommended the modification of the Alexander operation, by Franklin H. Martin, for I use it almost constantly when the abdomen is not to be opened for some reason other than uterine displacement.

It is well known that Kelly's suspension uteri operation produces two ligaments much like the round ligaments in appearance and texture; and permit the uterus to expand and contract. There is no other ligament that needs muscular tissue as much as the round ligament.

Dr. R. S. Hill, of Montgomery, Alabama.—Some years ago, retrodisplacement of the uterus was the storm centre of many discussions and from what we have witnessed today, it seems that the profession has not yet lost interest in the subject. There have been, as we all know, many operations devised for the relief of this condition, and this very fact is conclusive evidence that no one operation has been uniformly satisfactory. With my knowledge of Dr. Boldt as a leader in progressive professional spirit and action, I am somewhat surprised at his position that retrodisplacement is not a harmful condition. I cannot bring myself to an endorsement of this opinion. When we consider the care nature has taken in providing nerves, bloodvessels, and structural conditions to facilitate the function

of the uterus, we are forced to believe that she has been equally watchful in selecting the position best suited for its activity. In other words, there is no position of the uterus so well suited to its function as the normal. It cannot be doubted that backward displacement of the uterus is sometimes responsible for miscarriages. Therefore, from the stand-point of the child bearing function, this position is harmful and should be corrected. Now when we recall the number of venous plexuses, plexuses of veins without valves, in the pelvis—the vesical, uterine, ovarian, vaginal, vulvar, pampinaform, and hemorrhoidal—we must conclude that the displaced organ will likely interfere with the return circulation and thereby produce a congestion in the pelvic viscera. This congestion in the uterus and ovaries will sooner or later cause changes in the structure of these organs that will eventually become functionally manifested. Why is it we sometimes find a woman who is not complaining of her retrodisplacement? It is simply because the abnormal position has not existed long enough to overcome, in the particular case, the perhaps unusually great resisting power to its evil effects. It seems to me beyond question that retrodisplacement of the uterus should be corrected, and that too before structural changes have taken place. I must also express surprise at Dr. Boldt recommending a pessary. I am as much surprised at him recommending a pessary as I am at some others fixing and suspending the active uterus to the anterior abdominal wall. In my opinion we have passed the period when it is justifiable to resort to the pessary or either of these operations as a measure of choice, and I hope that they will soon go their way to the "limbo prepared for the childlike fancies of untaught minds."

Dr. S. M. D. Clark, of New Orleans, Louisiana.—Dr. Boldt has struck the keynote of this whole discussion when he stated that all displacements of the uterus did not need correction. I believe the uterus is essentially a movable organ, and that its mobility is more essential than its position. In my early experience, when I discovered a retrodisplaced uterus, I was very eager and urged that the condition be corrected by operation. Some of these women declined operation and I had occasion to follow them subsequently. To my surprise, many of them never had a single symptom that could be attributed to a displacement. Therefore, I began to think that many of these displacements were not pathological.

The round ligaments and the various way in which they can

be utilized in correcting displacements have received the bulk of attention from the medical men, but I am convinced that if the same amount of thought given to these round ligaments had been devoted toward determining just what displacements deserved operation and those that did not, womankind as a whole would have been more benefited.

It is the complications that are associated with displacements that produce pain and call for relief. I do not believe that the displacements *per se* are in any way responsible for these complications. I am convinced that in a few cases we find an uncomplicated displacement producing symptoms, and it is just in this type of case, where we wish to determine if the displacement is producing symptoms, that the use of a pessary is of value in reaching the diagnosis. If the woman is relieved by the use of the pessary and her symptoms return upon its removal, then it is reasonable to conclude that the displacement is responsible for the symptoms, and *vice versa.*

As to the best method of dealing with displacements, when treatment of the same is necessary, largely depends upon the individual case. Where both tubes have been removed and the ovaries conserved, a simple abdominal suspension, such as the Kelly operation, is the quickest and simplest method. This operation is never used where there is a possibility of pregnancy, only being employed for holding the uterus forward, thus preventing it from falling back into its old bed of adhesions. Wherever pregnancy is possible, the round ligament is unquestionably the operation of choice.

In fat women the Gilliam operation is to be preferred. In normally developed cases, the Noble-Mayo-Barrett method is the one that I routinely employ. This latter operation has given me such good results, I can see no reason for changing.

Dr. R. C. Coffey, of Portland, Oregon.—I have been misunderstood. In the first place, Dr. Long thought I objected to the Kelly operation on the ground that the uterus gives way. On the contrary, I was trying to use the argument to show that the peritoneal attachment does not give way, but it has. Furthermore, I did not intend to convey the idea that muscle was not there for a most important and essential purpose, but not for the purpose of direct suspension. It is for the purpose of poising the uterus, adapting it to the different positions which a woman occupies. Falling down or being thrown out of position the round ligament yanks it back into position, but does

not suspend it. The round ligament should not be permanently fixed so that it cannot move itself out, therefore catgut is used. The round ligament has straightened it out. Dr. Stone says that these ligaments after the Kelly operation are found fully developed to the normal size. That is exactly right. It is exactly what they will do as soon as you take the constant weight of the uterus off of them. That is exactly what happens in the plication operation which we recommend. Even when the ligaments are not as large as a broom straw at the time of operation. We find on opening the abdomen afterward they will have straightened out and thickened up as soon as the ligament has had a chance for its muscle fibers to concentrate into a mass. That has been found in every single instance, and the same round ligament, as soon as you shorten the broad ligament, thickens up as well. It is a well known orthopedic principle. I contend that the operation to be successful must in the first place use the peritoneum and, in the second place, must not permanently fix the round ligament.

Dr. Byford (closing the discussion).—There is not very much for me to say in reply, because the criticisms have been directed mainly at the other speakers rather than to myself, and the discussion has been mostly upon retroversion rather than upon the operation *per se*.

With regard to muscular and fascial support, I would like to call attention to the point that muscle gives only supplementary support to the organs, the fascia affords the real support. On the other hand, without the muscle to act when extra support is needed, the fascial support may be inadequate. For instance, the head of the humerus is kept in place by ligaments, but temporary muscular support is necessary to prevent its dislocation by violence. The normal round ligament exerts almost no influence upon the position of the uterus when the bladder is empty. Only when the fundus is pushed up by the filling bladder does the ligament act. The stretched muscle begins to pull the fundus downward the moment the collapsing bladder relieves the strain. When the relaxed round ligament is shortened its peripheral connective-tissue fibers are put upon the stretch and aid in keeping the fundus from drifting backward while the bladder is empty.

As to the point made by Dr. Coffey, the fact that the Alexander operation has stood the test proves that the round ligaments can give the required support.

With regard to drawing the ligament out of its peritoneal covering, as has been suggested, I prefer not to disturb the peritoneal covering in order that the indirect supporting action through its broad ligament connection may not be lost.

The Webster-Baldy operation usually keeps the fundus forward, but around the ligatures there is usually an exudate which is not always completely removed and sometimes causes symptoms. It is such results that have led me to try and accomplish my object without leaving sutures on or about the uterus.

Dr. Stone suggests making an extra incision on either side, pulling the ligament through and suturing it on the fascia. This would make an efficient operation, but would complicate the method I propose and make it less desirable than an Alexander operation. The simplicity, ease of performance, and small amount of traumatism are my reasons for preferring this method to Alexander's in cases in which the abdominal incision has been made.

THE TREATMENT OF VESICAL FISTULÆ AT THE VAGINAL VAULT FOLLOWING SURGICAL OPERATIONS

By Howard A. Kelly, M.D.
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Occasionally after an operation for a fibroid tumor, and more frequently after an operation for an advanced cancer of the cervix, where the disease has extended anteriorly, a vesical fistula is left which is troublesome and persistent, rarely tending to close of itself. The opening is always found high up at the vaginal vault, where it is fixed by scar tissue, often inaccessible and difficult to manipulate by any operation through the vaginal introitus. I have seen such cases operated upon repeatedly and in vain. One of the difficulties arises from the fact that the patient, if she has had a fibroid tumor is often unmarried or nulliparous, has a tight vaginal orifice which adds to the embarrassment of the surgeon. Furthermore, the margins of the fistula are often thin and devitalized, and ill-adapted to denudation and approximation. Added to these technical hindrances is the constant dread of the operator lest he should make a small opening on the peritoneum and introduce infection with the risk of a fatal peritonitis.

I have discovered an excellent plan of operating upon these cases which obviates all the difficulties and dangers, simplifies the treatment, and, I believe, gives a maximum certainty of cure. The patient lies well anesthetized in the lithotomy posture, with the posterior vaginal wall well

retracted; if necessary a paravaginal incision is made to expose the vault and the fistula. Then the operator cuts transversely just above or through the scar tissue, and carefully but with deliberate purpose opens the peritoneal cavity the very first thing. As soon as the peritoneum is opened the incision is continued from side to side until it reaches a maximum width, and it is possible to introduce three fingers by which it is further extended from side to side until it is as big as it is in the operation for vaginal hysterectomy. This must be done without injuring the bladder or affecting the fistulous tract in any way. The previously taut tissues are now set free to such an extent that they lie loose and flaccid, dropping down toward the outlet into any desired position for denudation and suturing. A good plan now is to incise the tissues longitudinally through the fistula down to the bladder, which is dissected away from the vagina and sewed up separately with one or two layers of a fine chromic catgut suture, after which the vagina is conveniently united over the vesical wound, if the operator prefers it at a right angle to it, so that the two lines of suturing cross each other. Following such an operation, I usually leave an opening in the peritoneal cavity about a quarter of an inch wide for drainage. I have in some cases left a considerable part of the vesical peritoneum in the vagina, forming a new vaginal vault. A mushroom catheter is put into the bladder for a few days to keep it at rest during the first part of the healing process, and the patient remains in bed from eight to twelve days, the peritoneal drain being removed in from four to six days.

In one of my recent cases, I started in, intending to open through the vaginal vault into the peritoneum; but as I cut a little behind the scar at the vault, I found that I could dissect up the scar area from side to side and detach it and the peritoneum above the rectum with its fat, and so set the tissues free and loosen them up sufficiently from the surrounding parts to be able to bring the fistula down

and close it perfectly without opening the peritoneal cavity at all. This was an exceptional case, and the method when applicable is of course better than the last. I feel sure that this procedure of setting free the fistula with all the surrounding tissues in order to denude and suture with perfect accuracy will simplify a class of cases in which we have often found ourselves in considerable difficulty in the past.

DISCUSSION

Dr. E. Denegre Martin, of New Orleans, Louisiana.—Only those who have operated upon such cases can fully appreciate the difficulty. My associate, Dr. Parham, has had an experience and reported a case recently which some of you may have heard of. In that case, after failure twice with the old methods, he carried out the suggestion of Dr. George Gray Ward, Jr., which was reported in 1910, in *Surgery, Gynecology, and Obstetrics*. It is practically the same thing as suggested by Dr. Kelly. Ward denudes the vaginal vault by making a crucial incision, beginning just below the meatus, dissecting down, then making a transverse incision and separating the vagina from the bladder. As soon as it is movable there is no trouble in drawing it out of the wound, closing the opening, and replacing the flaps again. In a third operation on the same patient by carrying out Ward's suggestion the result was successful. I assure you the difficulties are numerous, and unless you mobilize the bladder thoroughly you will fail every time.

Dr. Henry O. Marcy, of Boston, Massachusetts.—I am glad to bear testimony to the value of the method described by Dr. Kelly, but you will find practically the same method published in a paper entitled "The Cure of Vesicovaginal Fistula by the Free Dissection of the Bladder from its Vaginal Attachments and Closure with the Buried Continuous Suture," which I presented to the American Medical Association at the Philadelphia meeting in June, 1897.

It is safe and not very difficult, having split the edges of a retracted vesicovaginal fistula, to separate wholly the bladder from the vagina. When this has been effected, but not until the dissection is complete, the opening in the bladder wall is

refreshed and closed by a double line of continuous sutures, as already described, carefully avoiding penetration of the mucous membrane, using for suture material a fine tendon.

The insertion of the suture in the bladder wall is in the following manner: The needle is a fine one, curved upon the flat, with eye near the point, and set in a firm handle, made to penetrate the coats of the bladder or the intestine also, but not through the mucous membrane. It emerges about one-fourth inch from the line of the openings, and is introduced upon the opposite side at a like distance. The needle is then unthreaded, rethreaded with the opposite end of the suture, and withdrawn. This makes the needle a suture-carrier like a shuttle, and holds in even coaptation the included structures in a double loop from side to side (shoemaker's stitch). One stitch follows another in an even continuous seam until the opening is completely closed. By this side-to-side coaptation the parts enclosed are held in juxtaposition the *breadth* of the enclosing loop, while the interrupted suture holds only the *width* of the suture material. The submucous penetration of the needle buries the suture in healthy vitalized structures and the line of stitches, taken one-fourth inch away from the edges of the wound, inverts the mucous membrane into the bladder. The final fixation of the suture is by one knot, a manifest advantage over leaving as many knots as stitches, while the continuous suture permits of an even adjustment of the enclosing force. It must be remembered that no undue force is used in the tightening of the stitches, since readjustment, retention, and rest, with a minimum of devitalization, are the factors in the relation of the sutured parts, as important as in the treatment of a fractured bone.

"The bladder wall having been closed, we have reminaing an operation not unlike that ordinarily undertaken for the cure of cystocele, with the exception that oftentimes the remaining vaginal structures are unduly minimized. How these structures shall be closed, so far as the fistula is concerned, is of minor importance. It is wise, however, to restore them as nearly as possible to their primal condition. I think that this is best effected in a general way by a method which for many years I have practiced—by the use of a single tendon suture applied with a Hagedorn needle, using a lacing stitch, the sutures being deeply imbedded from side to side. In this way the vaginal wall is coaptated in two or three layers and

the mucous surfaces of the vagina are carefully approximated. This results in an entirely closed wound, the anteroposterior diameter of which has been considerably increased: in the first place by the inversion of the mucous membrane of the bladder; in the second place by the approximation of the widely denuded structures upon the median line; and in the third place by the inversion of the approximated vaginal surfaces of the wound."

This paper was reprinted and mailed to the surgeons of America. I first learned about it from my own experience in opening the bladder independently of the vaginal tract. In all of these cases of bladder wounds closed from above within the peritoneal cavity, easy primary cure ensued. Then I asked myself how it came about, when failure usually resulted from operating through the vaginal tract. My conclusion was, we were uniting tissues with active function in opposite directions. The bladder wall distending in one way pulled on the sutures and the vaginal muscle in quite another. My first operations were in 1887. I freed these structures thoroughly one from the other and separated them independently.

Dr. Guy Le roy Hunner, Baltimore, Maryland.—I think we are all agreed that this is a most important principle to follow, to get the two layers thoroughly separated, so that we have the tissues to work with, and an absence of tension when we are through with the operation.

There is one criticism I would like to make as to the after-treatment; I may be wrong about it, but I detest a retention catheter after one of these fistula cases, and particularly after the class Dr. Kelly spoke of, where there is much new tissue in the base of the bladder, where the retention catheter will press, and cause necrosis and infection. I much prefer to estimate the safe capacity of the bladder and have the patient void frequently or have her catheterized as frequently as necessary, and about twice a day have an irrigation of the bladder with a solution of about 1 to 5000 or 1 to 2000 of silver nitrate.

Dr. I. S. Stone, Washington, District of Columbia.—As a matter of history it ought to be mentioned that this subject of separating the bladder was fully discussed in two papers at a meeting of the American Gynecological Society eight or ten years ago at Hot Springs. Separating the bladder at that time was discussed very freely and among others by Dr. Kelly

himself. He proposed there another operation, namely, to bring the uterus down and assist in covering a portion of the bladder that was sacrificed. But dissecting the bladder away was fully recognized at that time.

Dr. Thomas S. Cullen, of Baltimore, Maryland.—In cases of very large vesicovaginal fistula where the destruction of the base of the bladder has been so extensive that the location of the ureteral orifices is difficult to determine, it may be advisable to attack the fistulæ suprapubically. In such cases I have found a very simple procedure of much value. If one or both ureteral orifices be situated along the edge of the fistula then it will naturally be almost impossible to satisfactorily denude the edges of the fistula and approximate them without injury to or complete blockage of the ureteral orifices. Remembering that the ureter runs obliquely for a considerable distance in the bladder wall, one can with little or no danger slit up the ureter for half an inch. Then the ureteral orifice is half an inch from the margin of the fistula, now one can close the fistula with no danger whatever to the ureter.

Dr. Herman J. Boldt, of New York City.—In vesicovaginal operations one of the best ways to get free access to the fistula is by making an extensive paravaginal section. If we do not get this free access we fiddle around and never get success. We should endeavor to do these operations without the sacrifice of mucous membrane, and the best way to accomplish that has been by making a thorough flap-splitting operation and closing the mucosa separately, and then closing the vaginal mucosa. I have had some exceptionally difficult cases, and it is very seldom that there has been any failure if that procedure has been followed carefully, making an extensive paravaginal section and an extensive flap. That is one of the main points. If one expects to get satisfactory union by making a narrow denudation or a narrow flap, I am sure disappointment will frequently follow.

Dr. Vance.—What is your practice in regard to the use of the retention catheter?

Dr. Boldt.—I usually use one.

Dr. George H. Noble, Atlanta, Georgia.—It seems that each of the speakers have been advocating the Mackenrodt and Lauenstein operations. This is as it should be, for the older methods do not possess the same degree of merit.

In operating for urinary fistulæ in the vagina the one point

requiring more attention than any other is to secure free mobility of the bladder. The flap-splitting operations afford this advantage. Usually the bladder is closed transversely with fine catgut and the vagina sutured in its long axis.

The paper of the essayist, however, deals with fistulæ in the upper extremity of the vagina following hysterectomy. There we are confronted with an entirely different state of circumstances. In the first place the ureters may be drawn close together by contraction of the scar, and the bladder and rectum may be densely adherent; the chances for flap splitting are limited. The principles to follow, therefore, are free dissection, closure of the vesical mucosa with fine absorbable sutures, infolding of the muscularis vesicæ over them (suture in the mucosa), and if the peritoneum has been opened, reinforcing both lines of sutures by turning the peritoneum over them. When the fistula is above the upper extremity of the vagina, the latter may be dissected free, and used as a flap by suturing it to the bladder above the fistula.

REPORT OF TWO CASES OF FORMATION OF AN ARTIFICIAL VAGINA BY INTESTINAL TRANSPLANTATION

By H. J. Boldt, M.D.
New York

It is not my purpose to enter here into a detailed consideration of gynatresiæ, nor shall I even at this time say more than a few words concerning that particular feature to which I invite your attention, preferring to leave a more extended treatment for a future occasion.

My desire now is simply to place before the Association two additional cases of complete absence of the vagina, and in so doing to evoke discussion as to the best method of treatment of this unfortunate condition.

In devising intestinal transplantation for the making of an artificial vagina, Dr. Baldwin, of Columbus, rendered to women thus afflicted a service that should command the spelling of his name in glowing capital letters in the world's history of gynecology. The superiority of this device, and especially of the Baldwin method, has again and again been demonstrated. No other is so satisfactory. No other is nearly so effectual.

Personally, I have on several occasions used other methods for overcoming this malformation, but always with resulting failure. Though by one of these I found it possible to make a vagina which, aided by a plug, proved fairly serviceable for a month or two, but the invariable result was a gradual contraction of the canal, ending in a condition no whit better than before the operation.

To cite all the cases in which Baldwin's method has been employed is not my present intention. It suffices to say that a sufficient number are on record, unmarred by a single failure—when the technique, as described by him, was properly carried out—to warrant the assertion, not merely that the operation has come to stay permanently, but that it is the one and only form of surgical intervention for the overcoming of that malformation.

Two cases of complete congenital absence of the vagina were my recent good fortune:

A. S., aged twenty-three years. Referred to me by Dr. Solotaroff. Patient was married nine months and had never menstruated. For three to four days every month she complained of pain in the left lower abdomen. She had been twice operated upon by a gynecologist of good technical ability—once per abdomen, and once from below —without success. On the contrary a rectal fistula resulted.

The examination showed a dimple, less than 1 cm. in depth where the vagina should have been. This connected with a rectal fistula 0.5 cm. in diameter.

Rectal examination disclosed the presence of a small cervix, in contiguity with a uterus, which seemed somewhat harder in consistency, broader and thicker than the normal virginal uterus. On the left posterior surface of this, and intimately attached to it, a smaller mass was felt, very sensitive to touch, and having the shape of an ovary; its surface studded with small, hemp-seed-sized cysts. On the right side there was a similar condition, but the mass was smaller and not quite so sensitive to touch. These two masses were diagnosed to be the ovaries in a condition of small cystic degeneration. The Fallopian tubes could not be palpated.

The plan of operation was outlined to consist of opening of the abdomen and freeing of the uterus and adnexa, as it is done for a panhysterosalpingo-oöphorectomy. Then to eliminate about ten inches of the ileum to be used as an

artificial vagina, restoring the intestinal canal by lateral anastomosis. Because of the mishap to the previous operator, I decided that the making of the canal into which the bowel for the vagina was to be placed should be left for the last step. With the abdomen open I believed that in this particular instance there would be less risk of injury to the rectum when making the canal.

As a result of the previous abdominal operation there were many pelvic adhesions, but none that could not be separated readily. About six inches of ileum, next to the cecum, was rather firmly adherent to the posterior surface of the uterus and to the plevic floor. This had so much evidence of inflammation that it was thought best to exclude it. Hence the anastomosis was made between the cecum and ileum, after excluding this indurated part of the ileum.

With the abdomen open it was an easy matter to make the canal for the vagina and then to close the rectal fistula.

The uterus was amputated to within about 1 cm. of the terminal part of the cervix. A small quantity of comparatively fresh blood was found in the minute cervical cavity.

To form the vagina about ten inches of ileum was eliminated from the intestinal canal. The median part of the bowel was grasped with a sponge-holder and brought down to the vulvar orifice. The mesentery was, of course, left attached to the bowel, so as to keep up the circulation. The apices of the bowel were next sutured to the cervical stump with interrupted catgut stitches. The abdomen was then closed. The now proximal coil of the bowel was then sutured to the vulva with interrupted silk sutures. Next the bowel was opened and the interior wiped out with gauze strips soaked in boric acid solution. The everted bowel was further attached to the vulva with additional stitches.

S. P., aged twenty-one years; married eighteen months. Referred to me by Dr. Bluestone. This woman gave as

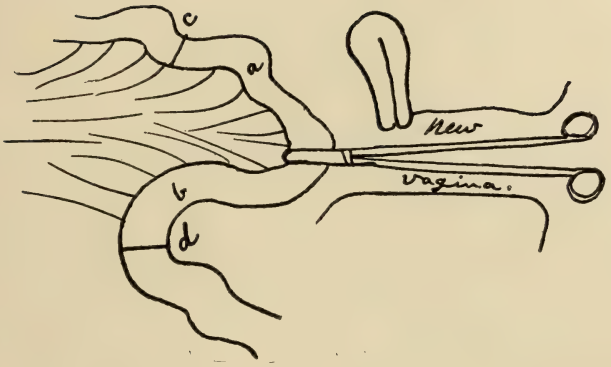

FIG. 1.—*a*, *b*, sigmoid; *c*, *d*, points for section.

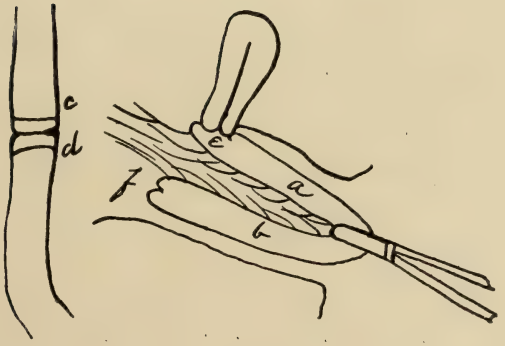

FIG. 2

her history that she was born without genitals; that she was operated upon in Louisville, Ky., but that the result (as is usual by the customary methods of operation) was complete failure. Her husband then refused to live with her. He was willing to live with her again, however, if she could be provided with a vagina that would be useful.

There was, in this instance, a rudimentary vagina about 2 cm. in depth. By rectal examination no pelvic organs were palpated. On opening the abdomen a rudimentary uterus, about 1 cm. in size, was found on each side, high up in the pelvic cavity. Attached to this was a normal-sized ovary, and attached to the ovary was a rudimentary Fallopian tube, about one-fifth the normal length, but with fairly well-developed fimbriæ. It was spread over the distal part of the ovary like a fan. The adnexum was extirpated from one side for histological examination. Frequent cramp-like attacks of pain in the ileocecal region complained of for a long time previously, found probable explanation in a vermiform appendix that was thickened to about three times its normal diameter, and filled with fecal concrements. In this case fully twelve inches of ileum were excluded from the intestinal canal, for the artificial vagina. Following a lateral anastomosis the vanginal canal was made. All four ends of the open bowel were closed by a purse-string suture, as in the previous case, and inverted. In this instance it was found that there was much tension on the mesentery, so that, at the terminal end, a small portion of the bowel was deprived of mesentery. The attachment of the bowel to the vulva was accomplished as in the previous case, but at the completion of the operation a clamp was at once placed on the septum between the bowel, whereas in the other instance the clamp was not placed on the bowel septum until after the lapse of five days. This patient, as well as the previous one, complained of much epigastric pain, while the clamp remained on the septum. When the clamp was again put on for the purpose of causing a slough of the

septum of the upper part of the artificial vagina, the pain, which I attribute to pressure on the nerves in the mesentery, was renewed.

The smooth convalescence in the second case was marred by a parietal wall abscess, which, however, cleared up in a few days. It was due to a colon bacillus infection.

Pathological Report on the Extirpated Adnexum. Fallopian tube: The sections show the normal structure of the Fallopian tube: Two muscular layers and a mucous membrane with the normal papillary outgrowths covered with cylindrical epithelium.

Ovary: The albuginea is thickened and shows new formation of dense connective tissue. The cortical zone shows considerable reduction in the number of the primordial follicles, which are very seldom, and embedded in a dense new-formed connective tissue. All the bloodvessels are dilated; the sections show in many places interstitial hemorrhage.

Diagnosis: Atrophied ovary.

Rudimentary uterus: Sections show a connective-tissue stroma with numerous fascicles of smooth fibers, the course and arrangement of which are irregular, crossing and interlacing.

Diagnosis: Smooth muscle tissue; rudimentary uterus.

DISCUSSION

Dr. Thomas S. Cullen, of Baltimore, Maryland.—I was much interested in this paper. I have had several cases where the pelvic organs were present, but where the vagina did not open externally, and where it was necessary to go up and find the vaginal mucosa and attach it to the skin. My cases have been between fifteen and eighteen years of age.

I would like to draw attention to one case in which the patient had no vagina at all. Thinking that the vagina existed in its upper portion I attempted to reach it. With one finger in the rectum and with a pair of artery forceps in the bladder it was

possible to gradually split the intervening septum without injuring either structure. After carrying the dissection upward for three or four inches I could feel a hard mass occupying the right side of the pelvis, and concluded that this was the uterus, somewhat dilated from an accumulation of menstrual flow.

As the condition was somewhat obscure I thought it was easier to open the abdomen. There was no uterus. The right ovary lay in the inguinal canal while the fimbrinated end of the right tube lay free along the pelvic wall. The right round ligament projected as a small loop into the pelvis. On the left side of the pelvis neither the tube nor the ovary were visible. They could, however, be felt in the inguinal canal. There was no left kidney.

In short, this patient had no vagina, no uterus, and only one kidney which lay in the pelvis. The tubes and ovaries were situated in the inguinal canals on either side. This case is reported in full in *Surgery, Gynecology, and Obstetrics*, July, 1910, pp. 73 to 75.

Dr. Cullen then referred to the method perfected by the late Alexander H. Ferguson for the formation of a new vagina, showed a small sketch that Dr. Ferguson himself had made of the operation, and said that Dr. Ferguson had used the method with a fair degree of satisfaction in several cases.

ADENOMYOMA OF THE RECTOVAGINAL SEPTUM[1]

By Thomas S. Cullen, M.D.
Baltimore, Maryland

At the meeting of the Canadian Medical Association in June, 1913, I incidentally referred to two cases of this character that had recently come under my care.[2]

This group of cases has in large measure escaped the attention of the surgeon. They are, however, of much interest not only to the pathologist but also to the operator.

Several months ago Dr. D. S. D. Jessup of New York, sent me slides from two pelvic tumors. In each case the tumor had been attached to the cervix posteriorly and had grown into the rectal wall. In each case the growth was so firmly fixed that, while the surgeon was doing a complete abdominal hysterectomy, he was compelled to remove at the same time a piece of the anterior rectal wall, as it was absolutely impossible to separate the uterus from the rectum. The slides that I examined showed non-striped muscle with islands of typical uterine mucosa scattered throughout them. The muscular tissue under the microscope was seen to be intimately blended with the rectal wall, but the rectal mucosa was perfectly normal. The histologic pictures in these two cases were identical with those found in adeno-

[1] From the Gynecological and Pathological departments of the Johns Hopkins Hospital and University. Read before the Southern Surgical and Gynecological Society, Atlanta, Ga., December 16, 1913.

[2] Cullen, Thomas S., Address in Gynecology, Canadian Med. Assoc. Jour., August, 1913.

myoma of the uterus.[1] An account of the two cases from which the specimens were taken will be published shortly by the surgeon who operated on the patients.

Within forty-eight hours after I had sent my report to Dr. Jessup, the February number of the *Proceedings of the Royal Society of Medicine* reached me, and in it was a similar case reported in full by Cuthbert Lockyer of London. His description was most lucid and the illustrations left absolutely no doubt that the case was one of adenomyoma of the rectovaginal septum.

LOCKYER'S CASES

CASE I.—*Teat-like projection in the vaginal fornix.*

Cuthbert Lockyer,[2] at the meeting of the obstetric and gynecologic section of the Royal Society of Medicine, January 2, 1913, before reporting a very interesting case of adenomyoma in the recto-uterine and rectovaginal septum, briefly referred to a case that he had previously seen in which there was a teat-like projection in the right vaginal fornix. This projection was covered over with vaginal mucosa. There was no ulceration and the growth lay close to the cervix on the right side and was long enough to be palpable before the examining finger reached the vaginal cervix. In this case there was no projection into the rectum and no operation had been performed.

CASE II.—*Adenomyoma of the recto-uterine and recto-vaginal septa.*

The patient, aged thirty-five years, was married but sterile. She complained of vaginal hemorrhage and pain. The periods had always been regular, but for twelve months the loss had been excessive, particularly for the last three months. There was great pain in the rectum, and defecation

[1] Cullen, Thomas S., Adenomyoma of the Uterus, Philadelphia, W. B. Saunders Company, 1908.

[2] Lockyer, Cuthbert, Proc. Roy. Soc. Med., 1913, vi, No. 4.

had become very difficult. The pain had been very severe for the past three months and the patient felt as if "something prevented the bowels from moving." The pain was always worse at night. For several weeks the patient had been bedridden. The hemorrhage for a few weeks previous to her entering the hospital had been practically continuous, but there had never been any bleeding from the bowel.

On vaginal examination a curious hard mass was felt in the posterior vaginal fornix; it was definitely fixed to the supravaginal cervix and adherent to the pelvic floor. The mass was found to project into the lumen of the rectum, but the overlying mucous membrane was intact. No definite diagnosis was made.

It was noted that, although the vaginal cervix was normal, the upper part of the posterior vaginal wall for a space of one and a half square inches was puckered and presented bluish-like varicosities.

Operation. When the abdomen was opened the appendages were found to be normal and the uterus small. The rectum and uterus had become fused together below the peritoneal reflection so that the two structures could only be moved *en masse* from side to side (Fig. 1). As it was impossible to remove either viscus apart from the other Lockyer proceeded to take the uterus and rectum out together. For this purpose he began as for a Wertheim panhysterectomy by dissecting out the ureters. The left ureter was very intimately adherent to the side of the rectum, to the growth and to the vagina. The right ureter was not adherent. After displacing the ureters and ligating the uterine vessels he carried the dissection anteriorly down as far as possible. The vagina was opened in front and the uterus was now freed from all its connections except where it was adherent to the rectum and to the undivided posterior vaginal wall. The rectum was next divided between clamps and the proximal end wrapped up and held aside in the upper angle of the wound. The edges of the vagina were ligated with several interrupted sutures.

The edges of the rectum were invaginated and then oversewn. The cellular tissues were tied off and the peritoneum of the pelvis was closed. A small vaginal drain was employed.

The sigmoid or upper free end of the bowel was brought out through a fresh lateral opening in the left iliac region and the central abdominal wound closed. Two drainage-tubes, however, were inserted down to the closed peritoneal level. The convalescence was disturbed, but the abdominal wound never broke down and the patient at the time of the meeting was sitting up, although still in the hospital.

Lockyer says that microscopically the growth had the structure of an adenomyoma, being made up of dense fibrous and muscular tissue in which were sparsely scattered simple gland tubules surrounded by very cellular tissue similar to that seen around the tubules or follicles of adenomyoma of the uterus (Fig. 2). Histologically, he says, the growth was comparatively benign, but with the naked eye it could be seen that the cervix as well as the anterior wall of the vagina had been definitely invaded by it. There were large hemorrhagic areas which ran down from the centre of the growth to the vaginal mucous membrane. The clinical observation that the mucosa of the bowel was intact proved to be correct, the only surface lesion being the puckering of the posterior vaginal wall.

Lockyer suggested that this tissue had developed from remains of the Wolffian duct. In discussing the case he said that had he known that the growth was not malignant he would have considered removing a portion of the rectum and closing in the opening, thus avoiding the necessity of making a permanent colostomy; but he drew attention to the fact that the rectal wall over a large area was firmly fixed and that in all probability it would have been necessary in this case to do a resection.

Two excellent illustrations accompany the communication. The first (Fig. 1) shows a longitudinal section of the uterus and the rectum with the growth lying between. The posterior

wall of the uterus near the cervix is much thickened and intimately blended with the growth. The rectal mucosa, although puckered, is everywhere intact.

Fig. 2 shows a section through the growth and rectal mucosa. The rectal mucous membrane is intact. The underlying growth is in large measure muscular in character. The gland spaces are large and small. Some of the glands lie in direct contact with the muscle, others are separated from it by a definite stroma.

There is absolutely no doubt that Lockyer was dealing with a typical adenomyoma. Its constituent elements were similar to those of adenomyoma of the uterus.

In the discussion of Dr. Lockyer's paper Dr. MacNaughton-Jones briefly referred to a patient, aged sixty-six years, a nullipara, who had a hard mass occupying the rectovaginal septum. This included the posterior aspect of the vagina with its upper two-thirds and had encroached laterally for some distance. No microscopic examination of this growth had been made, and consequently its exact character could not be determined, although the patient six months after a curettage was in good health and not suffering to any appreciable extent.

Mr. Clifford White in the same discussion said that he had observed two patients suffering from growths in the rectovaginal septum. Both had been admitted to the University College Hospital during the year. Clinically in both cases the tumors were malignant, but sections showed apparently simple adenomatous tissue. There were glands lined with a single layer of epithelium separated from the connective tissue by a definite basement-membrane. No proliferation of the epithelium was present. The connective tissue was fibrous and muscular and contained much lymphoid tissue. The squamous vaginal epithelium was thickened but not epitheliomatous. In neither case was an operation undertaken.

Mr. Herbert Spencer, referring to the cases mentioned

by Mr. Clifford White, said that in the first case the growth occupied the rectovaginal septum below the posterior lip of the cervix. The tissues around the rectum were infiltrated up to the pelvic wall and the exudate was nodular. He said that microscopic examination showed the growth to be an adenomyoma. As the patient was in good health he proposed to keep her under observation for the present.

My two cases, while somewhat different from those of Jessup and Lockyer, definitely belong to the same group. Case I shows a very early stage, whereas Case II clearly shows the later stages of the disease.

AUTHOR'S CASES

CASE I.—*Myomata of the uterus, adenomyoma between the cervix and rectum and associated with rectal adhesions.*

Mrs. G. P. E., seen in consultation with Dr. Samuel T. Earle, March 17, 1911, had several small polypi in the rectum. The uterus lay back on the bowel and was apparently adherent.

Operation. March 22, Dr. Earle burned away five or six rectal polypi which were situated directly behind the cervix. Microscopic examination of the growths showed that they had been undergoing definite inflammatory changes, as evidenced by the quantities of polymorphonuclear leukocytes on their surface and by the fact that the underlying stroma contained great quantities of small round cells.

After Dr. Earle had removed the polypi, I opened the abdomen. The rectum was adherent to the posterior surface of the uterus low down. On the left side was a corpus luteum cyst. This had evidently ruptured at some previous time, as the surrounding tissues were stained dark brown. I did a complete hysterectomy, removing the uterus and appendages, and then shelled out a myoma, 1 cm. in diameter, from the left side of the pelvic floor and another, about 4 cm. in diameter, with a secondary nodule, 1 cm. in diameter,

lying on its surface. This combined nodule was situated between the rectum and vagina on the left (Fig. 3).

October 12, 1911, the patient returned to me with signs of definite renal trouble. The röntgenogram showed a stone in the pelvis of each kidney. As the left kidney had apparently given more trouble than the right I removed the stone from the pelvis of that kidney. The patient improved markedly, but from time to time she experienced some pain in the right renal region.

November 19, 1913, I removed a stone from the pelvis of the right kidney. The patient at present is in excellent condition.

Pathological Report No. 16079. The uterus itself is only slightly enlarged. Scattered over the surface of the organ are several small fibroids. On microscopic examination the endometrium shows a definite endometritis.

The larger nodule lying between the cervix and rectum is 4 by 3 by 2 cm. and the smaller one 1 cm. in diameter. The larger nodule on histologic examination consists in the main of typical myomatous tissue, but at one point in a cleft (Fig. 4) are islands of typical uterine mucosa and at another point is a miniature uterine cavity. One of the smaller nodules contains one or two gland-like spaces.

From the history it will be noted that in this case the cervix was adherent to the rectum. We have here a connecting link between the ordinary adenomyoma of the uterus and an adenomyoma involving the rectum. It is the only case that I have ever seen showing just this stage.

Case II.—*Adenomyoma in the left broad ligament intimately blended with the rectum.*

Mrs. G. S., referred to me by Dr. E. C. Taliaferro of Norfolk, Va., was admitted to the Johns Hopkins Hospital June 4, 1913. This patient was aged thirty-seven years, and two years before had been operated on in San Francisco, a myomatous uterus and enlarged ovaries being removed. At that time it was necessary to remove a small portion of the rectum

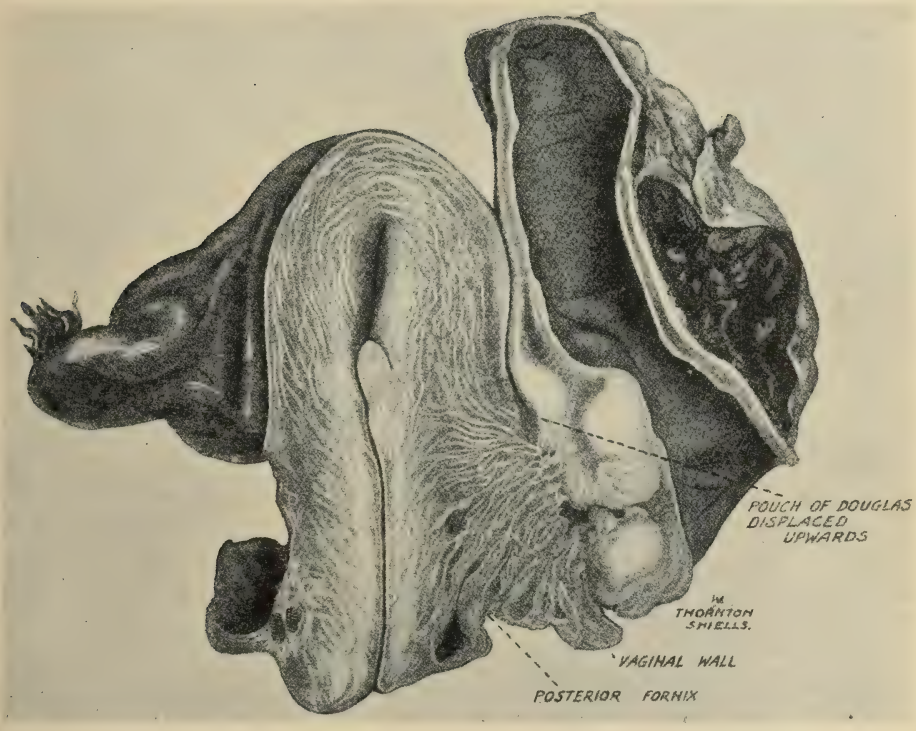

Fig. 1.—Adenomyoma of the rectovaginal septum. A longitudinal section of the uterus and rectum. The posterior wall of the cervix is occupied by a diffuse fibroid growth, which near the cervical canal contains irregular cavities. Posteriorly the growth is intimately blended with a tumor which has implicated the anterior rectal wall and markedly encroached on the lumen of the bowel. The rectal mucosa is still intact. For the histological picture see Fig. 2. (Copied from Cuthbert Lockyer.)

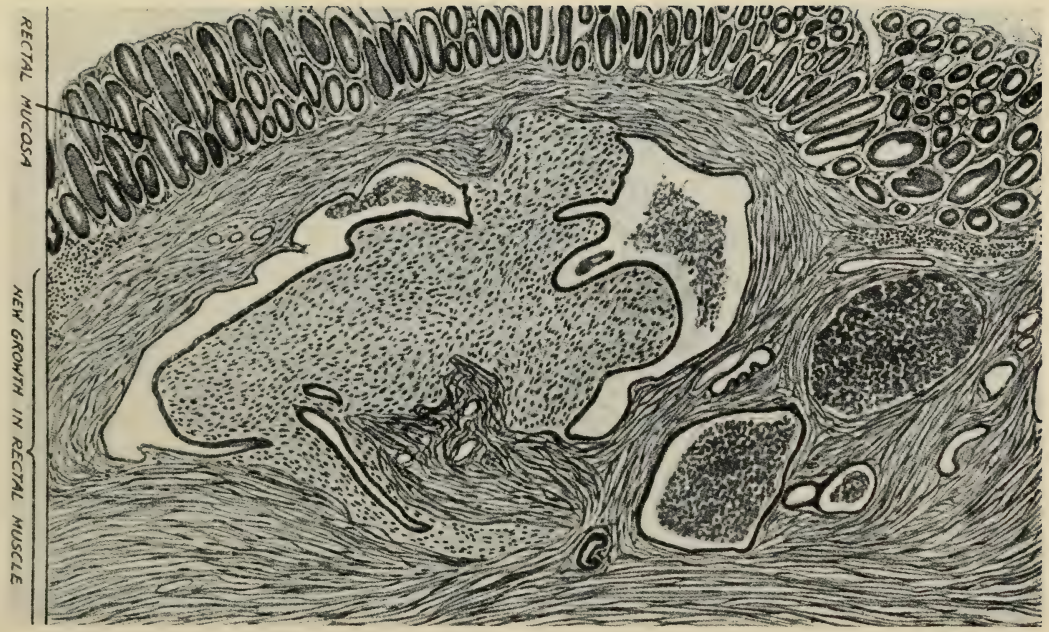

Fig. 2.—Adenomyoma of the rectovaginal septum. For the gross appearance of the tumor see Fig. 1. The section includes the rectal mucosa and a portion of the underlying tumor. The rectal mucosa is intact and normal. The tumor lying beneath it consists of non-striated muscle with glands scattered throughout it. Some of these glands lie in direct contact with the muscle and a few of them are dilated. The glandular area in the centre of the field has a definite stroma, which is sharply differentiated from the surrounding muscle. It is the characteristic stroma of the uterine mucosa. The tumor is so intimately blended with the rectal wall that no point of cleavage is possible. Consequently the operator would be forced to remove a portion of the rectum, if he attempted a complete excision of the tumor. (Copied from Cuthbert Lockyer.)

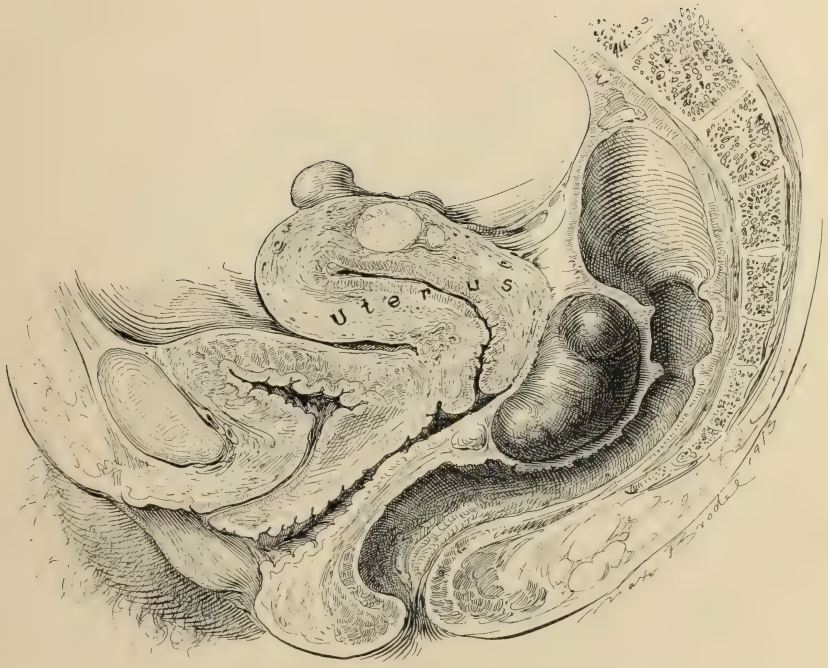

Fig. 3.—Adenomyoma of the rectovaginal septum. Gyn.-Path. No. 16079. A diagrammatic representation of the condition found at operation. The uterus contains several small subperitoneal and interstitial myomas. The cervix posteriorly is adherent to the rectum. Occupying the rectovaginal septum is an oval myomatous nodule, which projects into and narrows the lumen of the bowel. The overlying rectal mucosa is intact, but was the seat of several small rectal polypi. At operation the ureters were isolated and the uterus was then removed. The myoma in the rectovaginal septum, although intimately adherent to one ureter, was removed without injury to the ureter or to the rectum. For the histological picture of the nodule in the rectovaginal septum see Fig. 4.

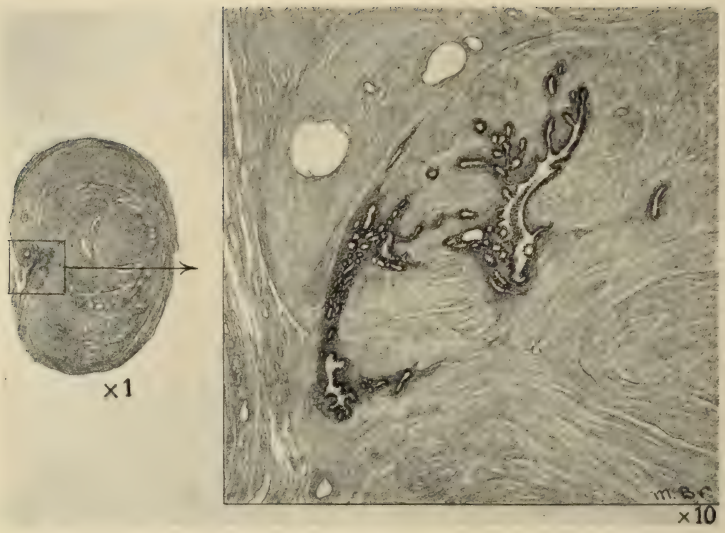

Fig. 4.—Adenomyoma of the rectovaginal septum. Gyn.-Path. No. 16079. For the gross appearances see Fig. 3. The point from which the drawing was made is indicated in the small sketch on the left. The greater portion of the tumor consisted of myomatous tissue. A glance at the islands of mucosa is sufficient to establish the fact that they consist of typical uterine mucosa. The glands resemble ordinary uterine glands and are surrounded by the characteristic stroma. The picture is identical with that noted in adenomyoma of the uterus.

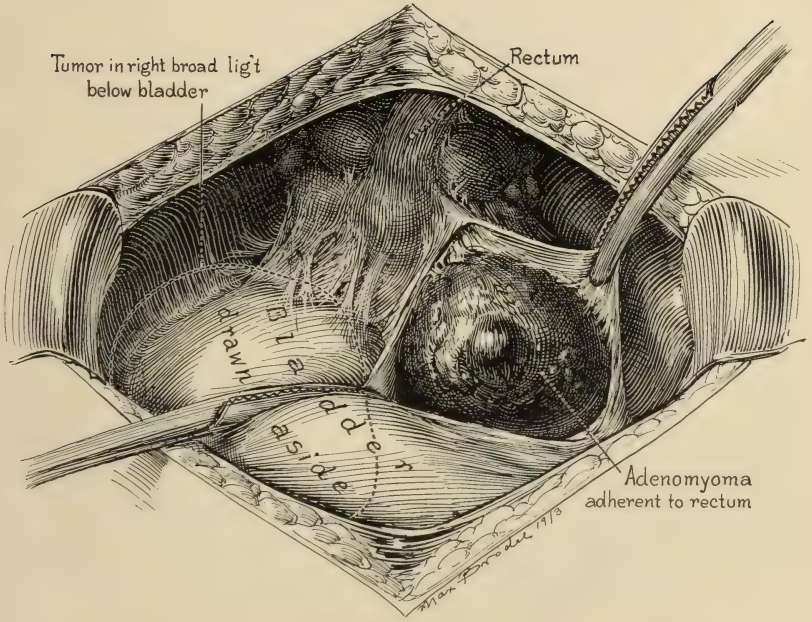

Fig. 5.—Adenomyoma of the broad ligament densely adherent to the rectum. A diagrammatic representation of the appearance of the pelvis at operation. As noted in the history, the uterus and appendages had been removed several years before. The bladder was densely adherent to the rectum. When the left broad ligament was opened up, a cystic mass was encountered, which was adherent to the pelvic wall and blended with the rectum. Its wall consisted of muscle and in its centre was a cavity about 2.5 cm. in diameter, lined with a brownish-tinged membrane. The cavity contained chocolate-colored blood. Fig. 6 gives the histological picture of the walls of this tumor. The right broad ligament also contained a firm mass probably similar in origin, but the condition of the patient did not warrant its exploration.

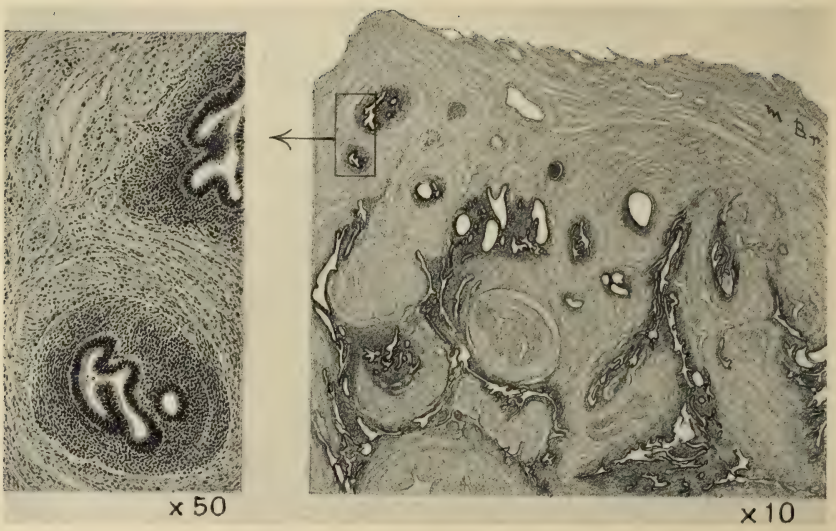

Fig. 6.—Adenomyoma in the left broad ligament. This section is from the tumor occupying the left broad ligament in Fig. 5. The tumor consists of myomatous tissue everywhere traversed by typical uterine mucosa. The glands are surrounded by the characteristic stroma of the mucosa, which is sharply differentiated from the surrounding muscle. Some are dilated. A few of the outlying ones lie in direct contact with the muscle. The small area indicated by the arrow has been enlarged. Here we see that the glands are lined with one layer of cylindrical epithelium and that their surrounding stroma stands out in sharp contrast to the muscle.

also on account of dense adhesions. She had a stormy convalescence and shortly after the operation developed intestinal obstruction.

After leaving the hospital she had had a great deal of pain in the lower abdomen and for months had had almost continuous bleeding from the cervix. On admission I found a thickening behind the cervix and induration in both broad ligaments. Although the patient was much weakened from the continuous loss of blood we felt that something must be done. The cervix was dilated and on curetting we brought away what on microscopic examination proved to be perfectly normal uterine mucosa. The supravaginal hysterectomy had evidently been a high one.

The right broad ligament was indurated and board-like and on the left side there was also thickening.

An attempt was made to build the patient up, but she continued to lose a great deal of blood and showed absolutely no improvement. A few days later we felt that it was imperative to explore the abdomen. When the operation was begun the pulse was 145. We found the rectum densely adherent to the bladder and the left broad ligament filled with a somewhat cystic mass. Those assisting at the operation thought we were dealing with a malignant growth, which had spread into both broad ligaments. In order to determine definitely I cut the left round ligament, separated the folds of the broad ligament, and found we were dealing with a cystic mass 6 cm. in diameter (Fig. 5). This was gradually shelled out from its attachment to the pelvic wall, but by the time this had been accomplished the patient's pulse had become almost imperceptible, the rate being from 180 to 190, although she had lost practically no blood. We removed the greater part of the growth, but left a portion still attached to the rectum and did not dare explore the right broad ligament. A drain was introduced into the pelvis and brought out through the lower angle of the incision. When the cystic mass that was attached to the rectum was

cut across we found that it contained one large irregular cavity about 2.5 cm. in diameter. This contained chocolate-colored fluid and was lined with a rather smooth-looking membrane which had a brownish tinge. The outer coats of the tumor looked like ordinary muscle.

On microscopic examination it was found that the wall of the blood-stained cyst was lined with one layer of cylindrical epithelium and that this rested on a definite stroma consisting of cells with oval vesicular nuclei. The more solid portions of the growth were made up of non-striped muscle fibres arranged in whorls and of quantities of uterine glands embedded in their characteristic stroma (Fig. 6). In some places only two or three glands with the surrounding stroma were visible, but at other points miniature uterine cavities were found.

In this case we were dealing with an adenomyoma, which had become densely adherent to the rectum. It was hoped that we might at a later date explore the right broad ligament, remove the cervix and then a portion of the rectum with which the growth was intimately blended. The patient, however, gradually, became weaker and died, June 19, 1913.

Adenomyoma of the uterus is now a well-recognized pathologic lesion and in many cases can be diagnosed clinically. That it is not rare is evident from the fact that I was able to report over 70 cases from the gynecologic clinic of the Johns Hopkins Hospital. It was clearly shown that in the majority of the cases the glands of the adenomyoma came from the uterine mucosa. It was further pointed out that portions of the growth might be carried into the uterine cavity, forming submucous adenomyomas, and that in other cases portions of the adenomyoma were carried outward, forming subperitoneal adenomyomas, and that these subperitoneal growths, when released from the compressing influence of the uterine wall, sometimes become cystic, the cyst fluid being chocolate-colored—an accumula-

tion of old menstrual blood. It was also demonstrated that an adenomyomatous uterus tends to become adherent to the surrounding structures.

I have reported elsewhere instances of adenomyoma of the round ligament[1] and tumors of the umbilicus consisting of adenomyomas.[2] All of these tumors, no matter where situated, showed the same clinical reaction, namely, swelling up at the menstrual period.

In my group of adenomyomas of the uterus were several of cervical origin. If these grow posteriorly, owing to their inherent tendency to become attached, they will spread out into the rectovaginal septum, and become adherent to the rectum, or the peritoneal surface of the cervix may grow fast to the peritoneal surface of the rectum. In either case the rectum becomes fixed to the cervix.

My Case I shows probably the earliest stage of such a condition. Lying in the pelvic floor were several myomas, the smaller ones consisting of simple myomatous tissue, the largest one measuring 4 by 3 by 2 cm. in diameter (Fig. 3) and containing a well-developed island of uterine mucosa (Fig. 4). It will be noted that even at this early stage the rectum was adherent to the posterior surface of the cervix. It was, however, possible to remove the uterus without injury to the bowel.

In Jessup's two cases the growth was so intimately blended with the rectum that in each it was necessary to remove a piece of the rectum with the uterus.

Lockyer's case represents a still further development of the adenomyoma. Such a wide area of the bowel was adherent that it was necessary to remove a complete segment of the rectum and to make a permanent colostomy.

In my Case II, when the abdomen was opened, in San

[1] Cullen, Thomas S., Adenomyoma of the Round Ligament, Bull. Johns Hopkins Hospital, 1896, Nos. 62 and 63.

[2] Cullen, Thomas S., Surgical Diseases of the Umbilicus, Jour. Amer. Med. Assoc., February 11, 1911, p. 391.

Francisco, the operator had found it necessary to remove a piece of the rectal wall with the adherent myomatous uterus. The patient's recovery was slow and complicated by an intestinal obstruction. When I saw the patient several years after the first operation she had had vaginal bleeding for months and was almost exsanguinated. When all attempts at building her up had failed, and the loss of blood still continued, as a last resort we did an exploratory operation, with the results recorded above. As noted from the history, the operation was necessarily an incomplete one, and hence it was impossible to tell the exact character of the thickening in the right broad ligament, but it was in all probability also adenomyomatous in character.

These cases are naturally of considerable interest to the surgeon. In the first place these growths, of course, are found only in women, and in the second place, histologically, they are not malignant; that is, they do not give rise to metastases. In the early stages, as shown in my Case I, the growth may be removed without injury to the rectum. When the growth has invaded the rectum to a limited extent it is necessary to remove only a small portion of the anterior wall of the rectum and the defect can be closed, still leaving a bowel of sufficient caliber. When the rectal involvement is extensive, as in Lockyer's Case II, resection of that portion of the bowel will, as a rule, be necessary.

The immediate differentiation between carcinoma of the bowel and adenomyomas of the rectovaginal septum is all-important to the surgeon. If the uterus contains myomas, the probability that the pelvic growth is an adenomyoma is strengthened. Further, if the growth appears to be muscular in origin this diagnosis is still more probable; if the growth is cystic, the diagnosis of adenomyoma is almost certain.

Cancer of the rectum starts in the mucous membrane, gradually infiltrates the bowel and then extends to the peritoneum and at a later stage may involve the cervix.

Clinically, there is a history of hemorrhage from the bowel. In adenomyoma of the rectovaginal septum, on the other hand, the only rectal symptom is painful defecation, or there are obstructive symptoms. On rectal examination the bowel mucosa may be found puckered but still intact. Thus it is seen that the differential diagnosis is relatively easy.

Adenomyomas of the rectovaginal septum are benign in so far as they do not give rise to metastases, and consequently if the entire growth be removed no further trouble need be feared. If portions be left these will continue to grow and will lead to more pelvic adhesions, and finally produce complications that may result in death or permanent invalidism. When cancer of the rectum is present the operation must of necessity be a much more extensive one.

This group of cases still more clearly emphasizes the necessity of a careful microscopic control of all rectal growths, as they might easily pass for rectal carcinomas and the cases be classified as permanent cures of rectal cancer, when the patient in reality never had cancer.

In cases of adenomyoma of the rectovaginal septum the ureters should be carefully isolated and the uterus then removed in its entirety as in the Wertheim operation. As soon as the vagina has been cut across the uterus and rectum are more mobile and can be drawn further up into the wound. The necessary oval or elliptic piece of rectum is now removed with the uterus and the bowel wound closed. The remaining stages of the operation are identical with those of the Wertheim procedure and it will be wise to place a delicate protective drain in the pelvis, taking care, however, that it does not come in contact with the suture line in the bowel. The lower end of the drain emerges from the vagina.

When the adenomyoma involves a large part of the lumen of the bowel, it will become necessary to resect a segment of the bowel.

The glands in these growths undoubtedly arise from the uterine mucosa or from remnants of Müller's duct. If they

were rectal adenomyomas, the glands would naturally be of the type composing the rectal mucosa.

The report of four cases in the course of a few months seems to indicate that adenomyoma of the rectovaginal septum is not rare; and with the more careful examination of all rectal or perirectal growths I feel confident that in the near future many more such cases will be recorded.

In conclusion I want to thank my friend, Mr. Max Brödel, director of the Department of "Art in Medicine," in the Johns Hopkins Medical School, for the excellent illustrations accompanying this article.

A NEW TECHNIQUE DESIGNED FOR TOTAL HYSTERECTOMY IN DIFFICULT CASES

ESPECIALLY FOR CANCER OF THE UTERUS, BY TWO OPERATORS WORKING SIMULTANEOUSLY, THROUGH THE ABDOMEN AND VAGINA

By A. C. Scott, M.D., F.A.C.S.
Temple, Texas

When one has carefully reviewed the masterly papers presented by several of the world's greatest gynecologists before the Clinical Congress of Surgeons of North America and American Gynecological Society during 1912 upon the subject of hysterectomy for uterine cancer, the natural inference is that the last word upon the technique of hysterectomy has been said, and I assure you that it is with a great deal of hesitation that I undertake to present anything to this body upon hysterectomy.

The technique of hysterectomy has made such wonderful progress during the last fifteen to twenty years that the operation has been placed upon a thoroughly scientific basis and the mortality has been reduced enormously. In fact, the mortality in uncomplicated cases has become almost insignificant. However, there are certain conditions occasionally met which prove to be exceedingly difficult in the hands of even skilful surgeons. It is a class of particularly difficult cases to which I wish to call your attention in this paper.

The cases to which I have special reference are those in

which the uterus is more or less fixed in the pelvis on account of rigidity of all the uterus supports which will not permit the uterus to be drawn low in the vagina during the progress of vaginal operations, and will not allow it to be drawn high in the pelvis in case the abdominal operation is chosen. Such rigidity or fixation may result from previous inflammation in the parametrum and other pelvic tissues, or from recent inflammation accompanying cancer. It may exist to a certain extent in nulliparous women who have passed middle life, or it may occur from retrograde changes after the menopause. In such cases there is not infrequently marked contraction of the vaginal vault, and if the patient is very corpulent, the difficulties accompanying the abdominal operation are considerably augmented. When total hysterectomy is indicated in such women, whether for cancer or some other pathological condition, hysterectomy becomes an operation much more difficult of performance, and much more liable to the unfortunate occurrence of accidents, such as hemorrhage, injury to the bladder, ureters, intestines, etc., which every gynecologist of much experience has had to deal with too frequently. Bearing in mind that these complications, together with shock from excessive time consumed and infection figure conspicuously in the primary results after hysterectomy, we have worked out a technique at The Temple Sanitarium which has materially aided us in cases which are especially difficult, and it is this technique which we will endeavor to describe to you presently. Before doing so we wish to call attention to some of the disadvantages pertaining to both vaginal and abdominal hysterectomies when applied to the cases mentioned above.

In vaginal hysterectomies, when the operator makes traction on the cervix, it does not come down well; hence, after he has made the incision and attempts to ligate the uterine vessels, he has to make so much traction that he may tear some of them, and he cannot ligate sufficiently far from the uterine body to make his ligatures perfectly

secure. He may ligate the arteries after they have branched and fail to secure the uppermost branches. Presuming that he has gotten by those difficulties without hemorrhage or injury to the bladder and ureters, on account of the rigidity of the round and broad ligaments, he has great difficulty in bringing the fundus down sufficiently to ligate or securely clamp them. I need hardly mention the difficulties which may arise from intestinal adhesions and other pathological conditions of which he may be totally ignorant in working through the vaginal route.

When the abdominal operation is chosen, everyone dislikes the fat patient, but by means of large incisions, or by excision of a large portion of fat as practised by Howard Kelly and his associates, the difficulties with the fat patient are greatly reduced. However, if the patient is a nulliparous woman, and has a rigid muscular abdominal wall, the difficulties of access in abdominal operations still remain. After the fundus of the uterus is exposed, of course it is easy enough to ligate the ovarian vessels and round ligaments, but after the bladder is separated from the uterus, it becomes quite difficult to isolate the uterine vessels and the ureters sufficient to make ligation safe. When the parametrium and vaginal vaults are more or less elastic, the uterus is easily drawn up sufficient to make ligation easy, but when they are very rigid, it is only by the greatest care that the vessels may be ligated and severed without some small branch giving trouble, and then too if the vessel in question should be the superior vaginal artery, after the vagina has been incised from above, it is sometimes no little matter to put an end to such an annoyance. By the abdominal route there is less danger of sepsis, but every moment wasted while the abdomen is open in a patient whose resistive power is distinctly below normal counts much in the matter of increased chances for a fatal result.

While we have not done the Wertheim operation, and do not think we will do it until the technique is sufficiently

perfect to still further reduce the mortality reported by that able operator and a few of our leading American gynecologists, the technique herewith described will not deter one from removing the pelvic glands after the uterus is out of the way if he should choose to do so.

We presented a paper before this Association two years ago, in which we described a position for combined abdominal and pelvic outlet operations, requiring simultaneous team-work of two surgeons. We still adhere, and with more confidence than ever, to the effectiveness of team work. It has proved to be so effectual along so many lines of human endeavor, and is becoming so well recognized in other departments of medicine, that the time is fast drawing to a close when the doctor must assume before his clientele to know everything and be able to do everything which pertains to the treatment of a given case; and I believe that it is quite certain that team-work in connection with certain grave and difficult surgical operations will be recognized as most effectual, and, therefore, receive the approval of professional and laity alike.

Dr. J. Craid Neil, in reporting results of Wertheim operations in the clinic of Dr. Howard Kelly before the American Gynecological Association in 1912, well says, "Any procedure which will lessen the time for the operation, the immediate shock and yet guarantee the same thoroughness, should be employed in every case." This the team-work will do. We have not done a sufficient number of hysterectomies by this technique to justify a report upon final results at this time, but the ease and speed with which it has been performed in those cases which usually prove most difficult seem to make a description appropriate now. At a later period we hope to make a detailed report of cases worthy of consideration.

In the operation which we do the patient is placed upon the edge of the table, as if for lithotomy or vaginal hysterectomy, but instead of the limbs being fastened to the upright

leg holders at the corners of the table in a position in which the thighs are flexed upon the abdomen, the limbs are held by a modification of the Bierhoff knee-holders so that the thighs are extended and widely abducted. When fastened in this position the table may be elevated as high as may be desired and the Edebohls speculum used as for ordinary operations through the vagina. Two operators are required, and the one who operates through the vagina either sits or stands according to whether the abdominal operator desires the horizontal or the elevated position. Both operators begin simultaneously. The vaginal operator, after having flooded the vagina with alcohol and swabbed it with iodin, proceeds to destroy and sterilize all accessible diseased tissue with the actual cautery. If the case is a cancerous one, he uses no knife at all, but surrounds the cervix with a cautery incision through the vaginal wall. This is made not far above the point of the cervix on the anterior side to loosen the cervix from the bladder attachment, taking care to work away from the bladder as much as possible. In the meantime the abdominal operator has incised the abdominal wall, separated any adhesions to the uterus and appendages, packed off the intestines, ligated and severed the ovarian vessels and round ligaments, and separated the bladder from the uterus, carefully approaching the cautery of the vaginal operator, which is now working near the bladder attachment to the cervix. By coöperation of the two operators at this point, while an assistant holds the bladder well forward, the bladder may be safely separated from the cervix without perforation. In cancer of the cervix involving the vagina dissection of the bladder may be carried down by the abdominal operator on the anterior vaginal wall to a point safely below the cancerous disease, which information is communicated to him by the vaginal operator, who can see the lesion and feel the fingers of the abdominal operator through the vaginal wall. When the bladder is sufficiently out of the way the vaginal operator proceeds with a cautery and its use is guided by the

sense of touch and sight from both view-points. During this time the sterile fingers of the abdominal operator are limited to the sterile field, whereas the use of the cautery is limited to the septic field, a large part of which, of course, is sterilized in a great measure. In case the interior of the uterus is septic it may, without hesitation, be quickly and thoroughly sterilized by plunging into it the red-hot cautery handled by the vaginal operator under the guidance of the hands of the abdominal operator whose sense of touch gives him specific and valuable information concerning the position of the cautery in its relation to any irregular places that may exist in the uterine wall (Fig. 1). When the vaginal operator is ready to separate the vagina from the cervix posteriorly and laterally, he does so under the guidance of the abdominal operator's fingers (Fig. 2). The uterine vessels are isolated by pushing the fingers through the parametrium between the ureter and the vessels as practiced by Wertheim. As soon as this step is accomplished, the vaginal operator carefully introduces the Pryor's clamp without touching its blades to any portion of the vaginal wall (Fig. 3), and guided by the eye and fingers of the abdominal operator grasps the uterine vessels as far from the uterus as possible, while, at the same moment, the bladder and ureter are drawn laterally and anteriorly by a narrow flat retractor introduced through the abdomen. Before the forceps are permanently closed the abdominal operator sees to it that no branch of the uterine vessels is left out of its grasp (Fig. 4). After closure of the forceps the vaginal operator now re-introduces the cautery and slowly severe the uterine vessels and parametrium from the uterus, letting the cautery rest in contact with the forceps sufficient to heat them to a moderate degree, thus in a measure destroying any cancerous cells that may exist in the parametrium grasped by the forceps. The cautery in severing the uterine vessels and parametrium by heating the clamp cooks the parametrium in the grasp of the clamps, much as is done by Werder, Downs, Dickson

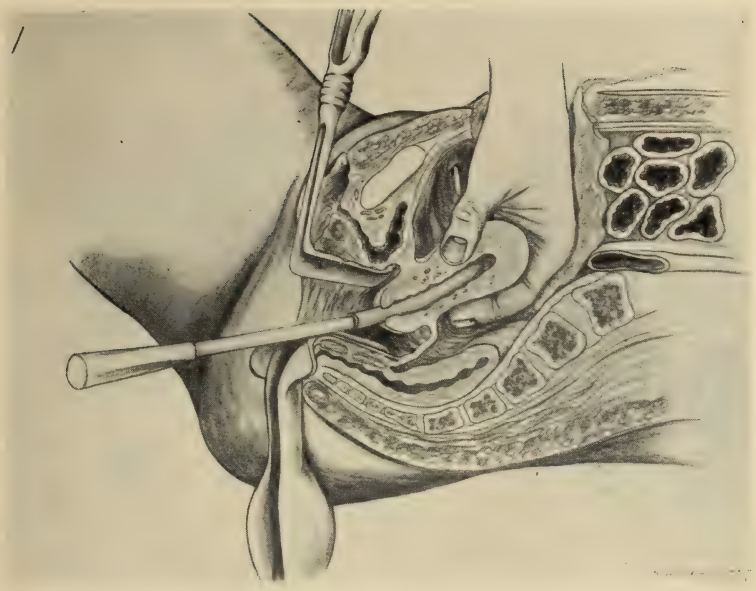

FIG. 1.—The interior of the uterus may be quickly and safely sterilized with a red-hot cautery.

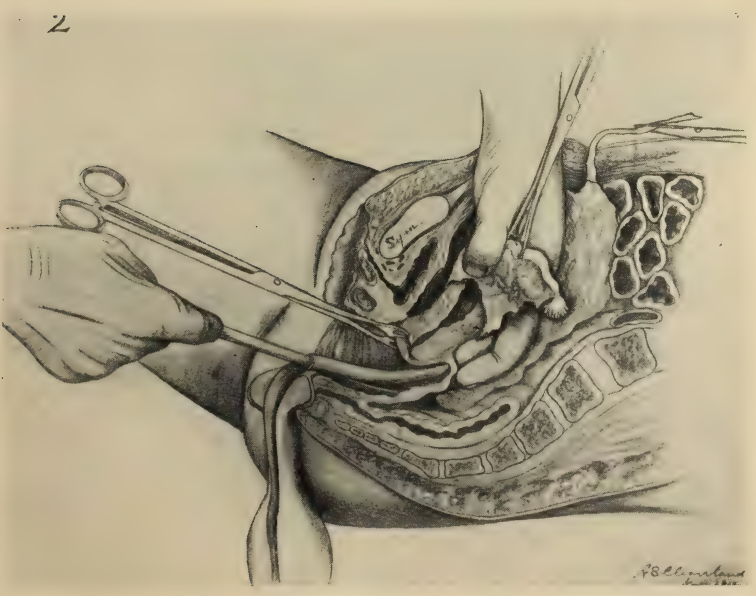

FIG. 2.—The vagina is separated from the cervix with the cautery under guidance of the abdominal operator's fingers.

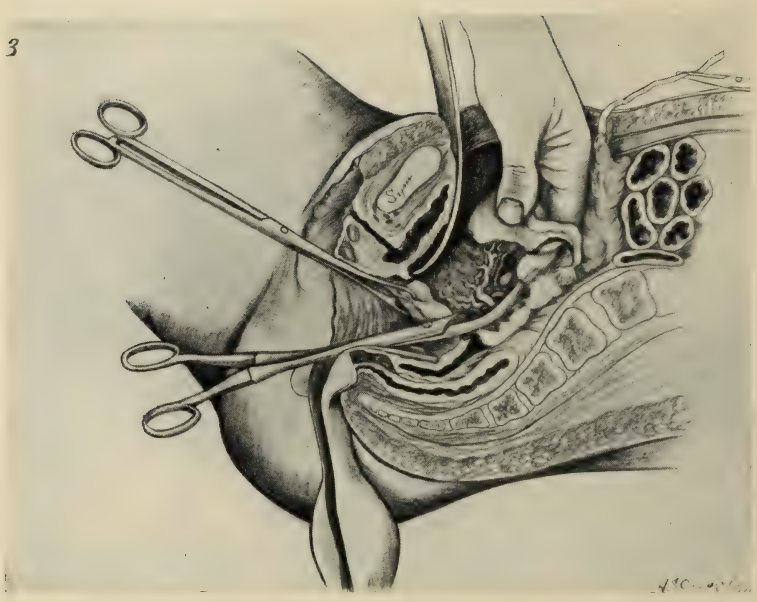

FIG. 3.—Pryor's clamp, guided by the eye and fingers of the abdominal operator, grasps the uterine vessels.

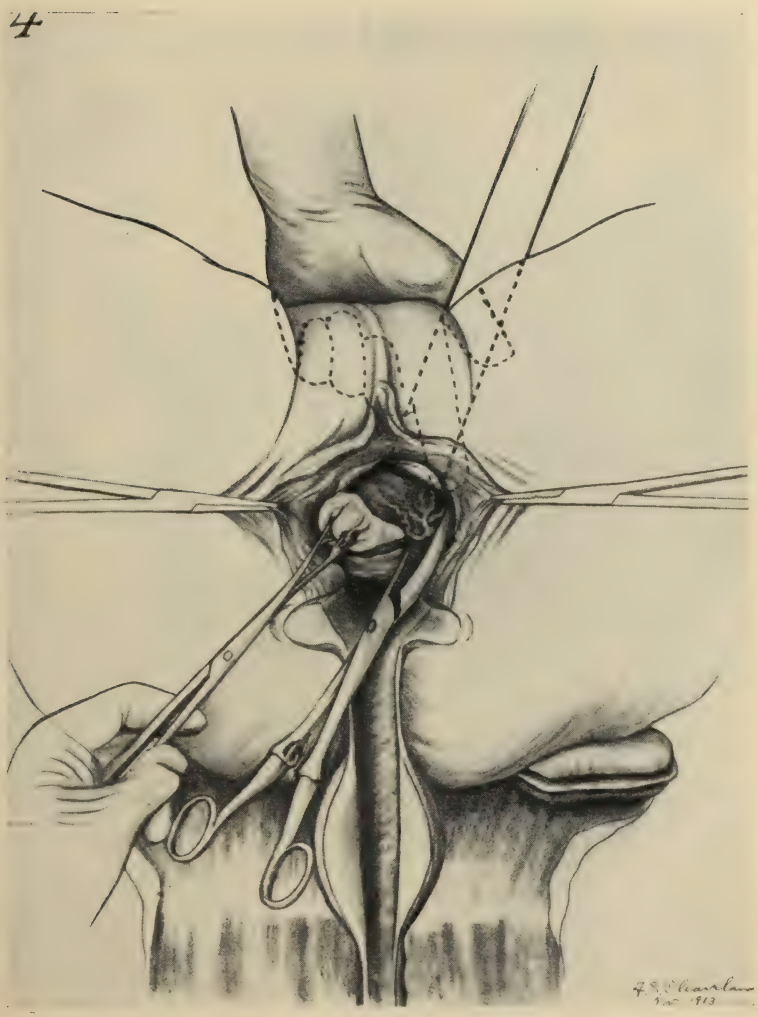

Fig. 4.—The abdominal operator sees to it that no branch of the uterine vessels is left out of the grasp of the forceps.

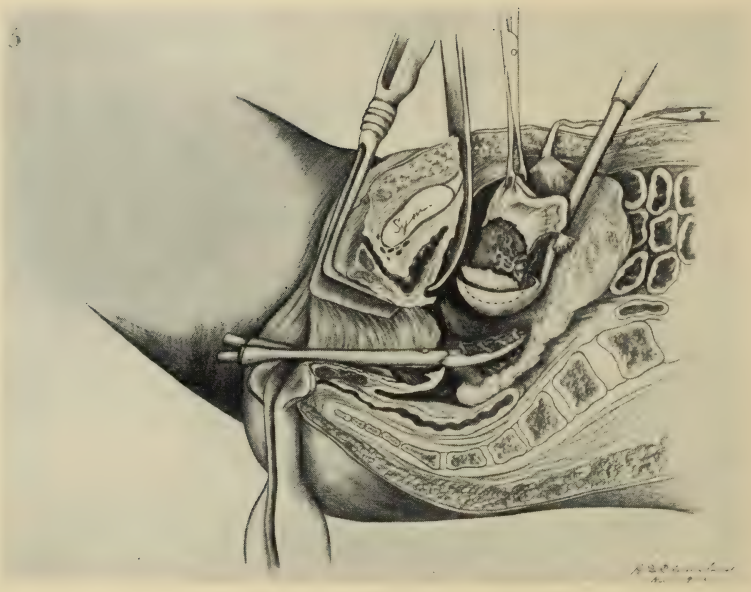

FIG. 5.—A ladle is slipped beneath the cervix and the uterus is lifted out without permitting septic material to drip into the field.

and others, who use the electrocautery clamp. Microscopic examinations of sections made in our laboratory from cancerous tissues removed by us with the actual cautery has shown that the cancerous cells are often destroyed beyond recognition for distances varying from 3 to 10 mm. beyond the charred tissue, the distance depending largely upon whether the cauterization is done rapidly or slowly. If the case is a cancerous one, the same attention having been given to the uterine vessels and parametrium of the opposite side, a ladle is slipped beneath the cervix by the abdominal operator and the uterus is lifted out without permitting any septic or doubtful material to drip into the abdomen during this process (Fig. 5). In the absence of a ladle a thick gause sponge should be used for this purpose. When the uterus is small it may be delivered through the vagina. It will be noted that during this process the vaginal operator has not thrust his fingers nor his instruments above the vaginal vault, this being regarded the dead line, except when he had introduced a sterile clamp on each side and followed that with a cautery. In this way contamination of the pelvic tissues and peritoneum is avoided. All manipulations involving peritoneum and cellular tissues have been done with the sterile hands of the abdominal operator, and he has taken care not to slip his fingers or instruments into the vagina, the top of which is now partly closed by one or two mattress sutures placed anteroposteriorly in such a way as to invert the margin of the vagina, bringing the raw surfaces in contact and anchoring the free margin with the bladder and peritoneum at that point. The forceps remaining in position for thirty-six or forty-eight hours serve as very good drains for the small pockets which remain laterally between the peritoneum and margin of the vagina. When it is deemed best to use other drainage, cigarette drains are introduced from above and grasped at the vault of the vagina by the vaginal operator and then drawn through until the remaining sterile end is in the position indicated

by the abdominal operator. During the entire operation, great care is taken to avoid careless mopping by which the vaginal operator might carry infected sponges from the vagina to the tissues above, or by which the abdominal operator might contaminate his sponges by getting them below the vaginal margin. Some of these small points of technique may seem unimportant, but inasmuch as a large proportion of total hysterectomies are made for cancer or other septic disease, and inasmuch as cancer is frequently re-implanted in neighboring tissues we cannot be unmindful of the little things which might in any degree influence the matter of recovery.

We have reason to believe that in the class of difficult cases for which it is particularly applicable this technique has the following advantages:

1. It permits more effective and safe destruction of cancerous tissues.

2. Sterilization of the interior of the uterus under safe guidance.

3. Better protection to bladder, ureters, and intestines during the cauterization of cancer involving the vault of the vagina, cervix, and body of the uterus.

4. It makes the extensive cauterization of the parametrium safer.

5. More complete hemostasis.

6. By the establishment of a dead line beyond which neither operator dares to venture with his sponges or instruments, except in the two instances described and by properly handling the uterus as it is withdrawn from the abdomen, danger of sepsis is reduced to a minimum.

7. The time saved by effectual hemostasis and synchronous team-work is particularly valuable in those cases in which the resistance is far below normal.

8. If the operator should feel warranted in doing the radical operation of Wertheim, this technique will greatly hasten his progress up to the point where he is ready to begin the

dissecting of pelvic glands. The uterine vessels can be more readily ligated after the uterus is out of the way if it is desirable to remove the clamps.

DISCUSSION

Dr. Francis Reder, of St. Louis, Missouri.—The paper presented by Dr. Scott is interesting in more than one respect. It is something new to me. I have been trying to reason out what class of cases the doctor calls difficult in which he would resort to the operation he has described. The class of cases I would look upon as difficult, I would not care to subject to the operative procedure just described. It is bad enough for a patient so afflicted when one operator undertakes the surgical relief for the condition not to say anything when two operators busy themselves surgically with the patient for the same condition and at the same time. I cannot see any advantage in this method. If the patient presents such a low resisting power as the doctor states, we have no right to attack her in the manner he has related. We have at our disposal one method which is a factor of safety in its application. I have reference to the cauterization method with the soldering iron. A thorough application of this method may, in some cases, bring about a more favorable aspect of the patient's condition. Should this improvement show itself, then a second invasion, such as an abdominal hysterectomy, is permissible. These are pathological conditions that are serious surgical problems. With the surgeon it is a matter of judgment and conscience.

FURTHER NOTES ON THE USE OF THE PAQUELIN CAUTERY IN CERVICITIS, WITH SPECIAL REFERENCE TO ITS VALUE IN STERILITY

By Guy L. Hunner, M.D.
Baltimore, Maryland

At our Louisville meeting, in 1906, I had the pleasure of presenting a paper entitled "The Treatment of Leucorrhea with the Actual Cautery" (*Jour. Amer. Med. Assoc.*, 1906, xlvi, 191).

Since that time I have had practically universal success with the use of this method in the class of cases then outlined, and have had many colleagues in different sections of the country testify to its successful use in their hands.

In that paper I spoke of my method as being a combination of two methods of treatment, which I had seen repeatedly used without permanent benefit. One of these methods was the incision of the cervix, with radial strokes of the scalpel, thereby emptying the deep mucous glands. I had observed the rapid healing of these incisions and prompt recurrence of the leucorrhea following such treatment.

The second method was the application of the actual cautery over the entire visible surface of the everted, inflamed mucosa. This seldom resulted in the destruction of more than the most superficial mucous glands, and after the sloughing and healing of the surface the leucorrhea was practically as bad as before.

From studies in the pathologic laboratory and observations

of the great depth to which some of these retention cervical glands burrow, it occurred to me that deep radial incisions made by the cautery blade rather than the scalpel would result in a destruction of the deep cervical glands as well as those near the surface. Experience shows that it takes from two to three weeks for the cautery slough to be entirely thrown off and for the area to be replaced by new tissue. For this reason the treatment should not occur oftener than every three weeks, and it is usually safer to give them about once a month, having the patient come one week after the menstrual period.

Consulting our colleague, Dr. Henry O. Marcy, concerning the historic aspects of the treatment of cervicitis, he referred me to the work of the English gynecologist, James Henry Bennet. I obtained the sixth American edition of his work entitled *A Practical Treatise on Inflammation of the Uterus, its Cervix and Appendages,* published in Philadelphia by Blanchard & Lea in 1864. His observations on cervicitis would do credit to any text-book of the present day. He remarks on page 241: "In what has been written by French pathologists on uterine diseases, there is no evidence of their being acquainted with the fact of inflammation so frequently penetrating and lurking in the cavity of the cervix. On the contrary, they mistake for indications of internal metritis the discharges which exist when the cervical cavity is inflamed or ulcerated." He differentiates clearly in his results of treatment between the ridding of the cervix of ulcerations and the reduction in the size of the hypertrophied cervix, or, as he expresses it, "melting inflammatory induration and hypertrophy." To show that Bennet, for his day, had a keen appreciation of the reparative processes set up by cauterization, I quote the following from page 262: "I wish it to be most distinctly understood that I do *not purpose to destroy* the hypertrophied cervix by cauterization, but merely to set up an artificial eliminatory inflammation, by means of an eschar or tissue of *limited extent,* established in

the centre of the hypertrophied region. I do not calculate in the remotest degree, on the destruction of the tissue to which the caustic or cautery gives rise, for diminishing the size of the hypertrophied cervix, but solely and entirely on *the inflammation subsequently set up.*" His favorite method of treating was with pencils of caustic potash or with a combination of this with lime in the form of potassa cum calce or Vienna paste. He warns against the careless use of this highly caustic material, and speaks of having seen many cases followed by too great cicatrix, stenosis, dysmenorrhea, and interference with labor when the applications had been made by inexperienced or careless operators.

Bennet devotes considerable space to a discussion of the use of the actual cautery in cervicitis. He says: "Celsus recommends ulcers of the prolapsed uterus to be cauterized with the actual cautery, and other modern surgeons have proposed the same means of treatment, as, for instance, Percy and Baron Larrey. It does not, however, mean that these suggestions were acted upon until adopted by M. Jobert de Lamballe, the talented Paris surgeon, who has long resorted, with great success, to this mode of treating chronic inflammatory induration of the neck of the uterus. Indeed, he adopts the actual cautery as a general means of treatment, using it in cases of intractable ulceration, as well as in severe inflammatory hypertrophy.

"In order to protect the vagina from the heat which radiates from the cautery, especially if the one employed is large, a conical ivory speculum may be used, ivory being a bad conductor of caloric. This precaution, although always adopted by M. Jobert, is not, however, indispensable. One or two olive-shaped cauteries, heated to whiteness, may then be extinguished on the part of the cervix which has to be cauterized. An eschar, more or less deep, is thus formed, as by cauterization with potassa fusa. It is necessary that the cautery should be brought to a white heat, as otherwise it adheres to the tissues on being withdrawn. But little

pain is experienced by the patient, either at the time or subsequently, the eschar falling off from the sixth to the tenth day, according to the depth of the cauterization. When the actual cautery is used to remove inflammatory hypertrophy, two or more cauterizations may be necessary to restore the neck of the uterus to its natural size."

It appears from Bennet's discussion of the relative merits of the actual cautery and the Vienna paste, that both methods involved the entire circumference of the cervical canal, and unless used with discretion, serious stenosis resulted. It is probable that the preponderence of bad results in the hands of the profession at large, finally led to the oblivion of these methods so successfully practised by a few discreet surgeons as far back as 1840.

With the method of radial incisions, there is always left enough of healthy stroma between the sloughing areas to prevent serious stenosis. In this method of deep radial incisions, we may claim some of the diminution in size of the cervix to be due to actual destruction of tissues as well as to the "eliminatory inflammation" of Bennet.

In my first paper I warned against the use of the method in acute gonorrheal conditions and in cases in which there was any suspicion of epithelioma of the cervix. I also advised that the treatments should cease after all evidence of cervicitis had disappeared in those occasional cases in which a portion of the leucorrhea was coming from a true endometritis. To this class belong some of the chronic gonorrheal infections in which the inflammation gets into the endometrium or myometrium and persists. By destroying the infected cervical glands in these cases one can greatly lessen the leucorrhea, but the patient will still complain of the discharge from the uterine cavity.

Shortly after my first paper, I treated a patient with the cautery and she developed signs and symptoms of an acute pus tube within three days. She was a young woman, who gave a history of having had a leucorrheal discharge

since the birth of her child and a marked increase in the leucorrhea within the previous two weeks. This she attributed to an unusual amount of exercise at golf. I found a lacerated, inflamed cervix and a profuse leucorrhea. Not suspecting gonorrhea I used the cautery, and only after the development of the pus tube did I examine the discharge for the gonococcus and learn that the husband had recently strayed from his marital couch, with dire results.

It is possible that the patient would have developed pyosalpinx without the cautery's interference, but it is only reasonable to look for bad results if the tissues are disturbed with the cautery during an acute gonorrhea.

One patient consulted me for a profuse leucorrhea which occasionally became blood-tinged after coitus. I suspected that the large granular-looking cervix might possibly harbor a beginning epithelioma. An excised portion of the cervix showed microscopically only a severe chronic inflammation, which probably followed gonorrhea and the birth of but one child. The patient was anxious to become pregnant by her second husband. I gave her eight cautery treatments over the course of a year. The cervix had reduced to about the normal size and appearance, but she still had some leucorrhea, which I ascribed to an endometritis. I advised against an operation, as the patient had but little leucorrhea, was comfortable, and apparently had an old pelvic inflammatory condition about the adnexa.

I did not see her again for about three years, when she came with an advanced epithelioma of the cervix, for which I did the complete operation, and gave a bad prognosis. She died within a year.

There are some features of her case which make me feel that she may have had beginning epithelioma on her first visit and that the excised bit of cervix did not happen to be from the right portion to include this. On several occasions after the first few cautery treatments, she had considerable bleeding, this was apparently explained by the fact

that she gave a past history of profuse bleeding from any slight cut.

I find in my private records that 241 cases with abnormal cervix have been treated with the cautery. These have been divided into three classes, according to the probable etiology of the cervicitis:

First: 127 cases in which the cervicitis was probably due to child-bearing. The leucorrhea was profuse in 23, moderate in 99, and scant in 5. The 127 patients had a total of 326 treatments, or an average of 2.5. The result was marked *improved* in 65 cases with 117 treatments and *cured* in 62 cases with 209 treatments.

Second: 42 cases in which the cervicitis was probably due chiefly to gonorrhea. The leucorrhea was profuse in 25 and moderate in 17. The 42 patients had a total of 149 treatments, or an average of 3.3. The result was marked *improved* in 20 cases with 60 treatments and *cured* in 22 cases with 89 treatments.

Third: 72 cases in which the etiology was obscure. The leucorrhea was profuse in 13, moderate in 52, and scant in 7. The 72 cases had a total of 174 treatments, or an average of 2.4. The result was marked *improved* in 51 cases, with 106 treatments and *cured* in 21 cases with 68 treatments.

Anyone familiar with these cases of cervicitis and leucorrhea will recognize at once the arbitrary and inaccurate character of a classification such as the above. It is probable that the leucorrhea in some of the cases classified under child-bearing were due to gonorrhea more than to the injuries of parturition. It is also probable that some cases are classified as gonorrheal that should have been placed with the cases in which the leucorrhea was chiefly due to child-bearing. As stated above, acute gonorrheal cases are not treated with the cautery. The cases classified as gonorrheal were so designated, because I had previously seen them in the acute stages, or because of a typical history, or because of the genital canal appearances typical of gonorrhea.

Under the miscellaneous or third group were classified those cases who had not had children. Some of them, both married and unmarried, probably belonged in the gonorrheal class, but the evidence was not sufficient to make this diagnosis. Some were probably masturbators, or were leading an irregular sexual life; and in some the inflammation of the cervix was probably only one feature of a general vascular disturbance, or of an atonic lax condition of the tissues in general.

Some of the cases classified as *improved* rather than *cured* are those who lived out of town or for some other reason failed to carry the treatment to its conclusion, or cases who were seen and treated but once. Some of these probably failed to come for a second treatment, because of a satisfactory improvement in their condition. Knowing the effects of this treatment, I feel justified in classing such cases as improved, and I have called only those cured whom I have followed until the cervix appeared normal and the leucorrhea had ceased.

It will be noted that in the gonorrheal class there is a considerable percentage of cure. This is contrary to our expectations in this most chronic and persistant form of inflammation, but the good results are due to the fact that many of these patients have exhausted other methods of treatment and have such marked improvement from the beginning of the cautery treatments, that they are willing and anxious to return until the physician pronounces them cured.

We have already spoken of the occasional case in which there is an endometritis and a persistence of some leucorrhea after the cervix returns to normal. In another class of gonorrheal cases the repeated use of the cautery for the cervix results in a cessation of visible cervical discharge but there still remains irritating discharges due to vaginitis and vulvitis. In my list such cases are classified as improved because the patient is still bothered with a discharge,

although from the view-point of the cervix alone and the cautery treatment, they might be considered cured.

Most of these cases of chronic inflammation of the outer genital tract undergo steady improvement by having the tract swabbed with ten to twenty per cent. silver nitrate solution at the same time that the cervix is being cauterized; and after a half-dozen such treatments, extending over six months, together with the daily douching, many of them are symptomatically cured.

Six of my cases successfully treated with the cautery for chronic gonorrheal conditions were first seen by me in the acute stages. They were first treated for the acute gonorrhea by the approved methods and after from four to twelve months, the persistently enlarged cervix was treated with the cautery.

At times one is astonished to see what a change is brought about with but one treatment. A previously swollen, everted, and inflamed-looking cervix will sometimes look quite normal four weeks after the first cautery treatment. This is particularly true of the non-gonorrheal cases, and especially if the cervicitis results from child-bearing. If the enlargement is partially due to chronic passive congestion associated with retroflexion and retroversion, the use of the pessary and tampons contributes materially to the lessening of the size of the cervix.

An interesting group of cases includes those occasionally seen with retention cysts in the cervix, giving rise to reflex digestive disturbances, such as pain, nausea, and vomiting. Of five cases belonging to this group the most marked was that of Mrs. R., referred by Dr. C. Urban Smith.

This patient was aged twenty-four years, had been married two years, and had never been pregnant. Dr. Smith referred the patient, with a letter, stating that she had complained for some time of stomach symptoms like those of cardiac and pyloric spasm, with severe nervous belching of a periodic character, which in his judgment was due to some reflex from the pelvic organs.

She complained of terrible pains in the lower left side in the sigmoid region, and in addition to a constant discharge from the vagina, she occasionally passed great quantities of "slime and blood" from the vagina, and after this the pain and gastric symptoms were temporarily relieved.

I suspected from this history that she might have a left-sided pus tube which periodically discharged through the uterus. On examination I could find no evidence of a pus tube. The cervix was large and inflamed looking, with considerable eversion of the mucous membrane. As my examination did not reveal the cause of her trouble, I asked her to visit me at a time when she was having the pain and gastric disturbances. On her next visit she had just had one of her attacks, ending in the passage of a quantity of mucus from the vagina. She gathered about one dram of this and brought it in a bottle. It was found to contain blood, pus, and epithelial cells. On examination a depression was noticed in the cervix, marking the site of a rupture of a Nabothian follicle cyst. After three cautery treatments the cervix became normal in appearance, her gastric symptoms disappeared, and eight months later she became pregnant.

We occasionally see cases of true erosion of the cervix, particularly in senile or postmenopausal atrophy of the mucous membranes. These patients are likely to be much worried over the fear of cancer, as the leucorrhea often takes on a bloody character. The cautery is usually efficacious in bringing about a prompt restoration of these cases.

Occasionally after a high amputation of the cervix, and after sufficient time has elapsed for the patient to get over her postoperative weakness, a leucorrhea persists. Undoubtedly some of these cases result from failure to remove all of the deep cervical glands, and in some of them we find retention cysts several months after operation. In others the persistence of the discharge may be associated with some form of chronic stasis in the vascular system, such, for instance, as a general stasis due to mitral insufficiency or

a local stasis, due to varicose veins in the pelvis. The cautery often supplements the operation in these cases by curing the leucorrhea.

In addition to its use for chronic cevicitis, I have found the cautery valuable in many other forms of office treatment. There are a number of minor conditions which can be safely and satisfactorily handled without putting the patient to the worry, inconvenience, and expense of hospital treatment.

Urethral caruncle is notoriously a condition that persists in returning after removal by the knife or scissors. I have found that results are more satisfactory when their removal is accomplished with the cautery. After anesthetizing the urethral orifice with a swab of 10 per cent. cocain solution, applied for five minutes, the orifice is thoroughly dilated with the cone dilator. The papillomatous area is then charred deeply with the cautery, or, if it be a large caruncle, it may be first grasped with straight artery forceps and excised with knife or scissors, when the operation is completed by deeply charring the base with the cautery.

Since installing a high-frequency outfit for use in bladder papillomata, I have found this form of cauterization preferable to the Paquelin for removing urethral caruncle. The high-frequency spark, coming from the point of a wire, is more easily controlled, and the after-sloughing and healing are rather more prompt.

After treating caruncle with either the Paquelin or high-frequency spark, the patient should be seen about once a week and the urethra, after the cocaine applications, is touched with 5 or 10 per cent. silver nitrate solution until the wound is healed. Eight of my office cases have been treated by this method.

Certain cases present eversion or partial prolapse of the mucosa of the external urethral orifice, causing symptoms and appearances somewhat similar to caruncle. These conditions are promptly benefited by the cautery treatment.

Should a careful examination show that these inflammatory eversions have back of them an inflammation of Skene's glands, the treatment should begin with the destruction of these glands, as described below.

Another condition easily treated in the office is cervical polypus, of which I have had ten cases thus treated. Not infrequently there is considerable serosanguinous or actual bloody discharge associated with cervical polypus and if this occurs after the menopause, the patient may be considerably worried over the possibility of cancer, in fact I know of no other condition which so often makes the physician fear cancer when he is taking a patient's history.

After simple removal by twisting or by cutting the pedicle with knife or scissors, there is marked tendency for the polypus to return, thereby giving the patient fresh cause for worry about cancer. The polypus is much less likely to return if its base be thoroughly cauterized.

Fibroma of the vaginal wall, when attached by a narrow pedicle, can be grasped by crushing forceps and the pedicle severed with the cautery blade, or the pedicle may be cut with knife or scissors and any tendency to bleeding stopped by means of the cautery.

In cases of suspicious granulation of the cervix, we occasionally excise a small area for microscopic examination. The bleeding following this excision can generally be controlled by the heat of a dull cautery blade.

Abscess of the external genitalia, particularly retention abscesses of Skene's or Bartholin's glands, are often advantageously opened with the Paquelin cautery. The skin or mucous membrane may be anesthetized with 1 per cent. cocain injected from the hypodermic syringe, when the abscess can be laid widely open with the cautery blade. The burned wound edges do not tend to close as would a knife incision, and the abscess remains open until it granulates permanently from the bottom. This permanent closure depends upon the complete destruction of the gland mucous

membrane, and this is encouraged by swabbing out the cavity once a week with pure carbolic. This can be done without discomfort if the cavity is first swabbed with 10 per cent. solution of cocain.

In opening Skene's glands, which have become the seat of a chronic adenitis, it is necessary to first introduce a small silver probe, and by burning down upon this the vaginal wall is well opened while the urethral wall is protected by the probe. The complete destruction of the gland is accomplished by repeatedly burning out with pure carbolic as above indicated. Only one gland is treated at a time.

Value of the Cautery in Sterility. One of my chief reasons for writing this paper is to report a number of cases of pregnancy following the use of the cautery in patients who were complaining of sterility. Sterility is a condition so complex as to its possible causes, and often so apparently hopeless in our efforts at correction, that any method is worthy of report if it offers relief in even a very small percentage of cases.

In my first paper I reported the case of a woman who became pregnant after the cure by the cautery of a most intractable case of leucorrhea apparently due to an old gonorrheal infection. I considered this a cure of sterility by the removal of a mechanical obstruction in the form of profuse leucorrhea, and the possible significance of the use of the cautery in sterility cases did not occur to me until several of my sterility patients had become pregnant after the use of the cautery.

Later experience leads me to think that the cautery is useful not only in the cases with profuse leucorrhea, where the obstruction to the spermatozoa may be mechanical, but is useful as well in the cases of too acid secretion. One can frequently find a distinctly acid secretion at the mouth of the cervix, and after brushing this away the mucus from higher in the cervix is found alkaline. The cautery destroys the outer acid-secreting glands and gives the spermatozoa

better living conditions. I think Case IV, reported below, belongs to this class of hyperacid secretions, but unfortunately I had not awakened to the possible importance of this point and have no notes as to the reaction of her cervical secretions.

I have records of 15 cases becoming pregnant after the use of the cautery. A conservative estimate would class at least 6 of these cases as directly due to the cautery treatment. For convenience I shall review these 6 cases first and report them at rather greater length than the last 9 cases, in which it might be argued that the pregnancy was a coincidence rather than a result of the cautery treatment.

Case I.—Already reported rather fully in my first paper. She was aged twenty-six years; had one child by her first marriage, and since this childbirth most profuse leucorrhea. She had been married to her second husband for two years, and was extremely anxious for more children. I had an opportunity to study her condition for about a year, in which time Dr. Kelly, at one operation, did a dilatation and curettage and repair of the outlet, and at another operation did a vaginal salpingectomy on the left side. She had used douches faithfully all this time, had had the vagina burned out with various strengths of silver nitrate solution, had cervical cysts opened by the scalpel, and had had the entire cervical mucosa seared superficially with the Paquelin cautery. In spite of all this treatment the leucorrhea seemed as profuse as at first. After three or four treatments by deep radial incision with the cautery the vaginal discharge was practically of normal amount, and in less than a year the patient was pregnant.

Case II.—Patient was aged twenty-one years; had been married four years, and suffered all of that time with a profuse vaginal discharge, inaugurated with a severe gonorrheal infection. The husband was away from home during a period of two years, in which time I had relieved the cervical leucorrhea with six cautery treatments. The

patient became pregnant immediately after the husband's return.

Case III.—A Jewess, aged twenty-three years; had been married two years, and had apparently suffered with a gonorrheal infection immediately after marriage. She had been operated upon a few months before consulting me, having a dilatation and curettage, a left salpingo-oöphorectomy and a repair of the right tube. Her surgeon had written me that he considered the possibilities of a pregnancy as practically *nil.* The patient consulted me, insisting on another abdominal operation, to free adhesions and further the possibility of pregnancy. I found that she had considerable acid leucorrhea in spite of constant douching, and I took up the cautery treatment of the cervix, not with the idea of furthering pregnancy, but simply to rid her of the leucorrhea and to give me an opportunity in the meantime of dissuading her from her mad insistance on an operation. She lived out of the city, and had two cautery treatments on March 13 and and April 6, 1911. She had a period the last of April and missed the period due May 26, and gave birth to a male child March 1, 1912.

Case IV.—Seen October 17, 1910; aged twenty-eight years; married four years; normal menstrual periods; free from pain.

In April, 1908 she consulted a prominent Philadelphia gynecologist concerning the desire for pregnancy. She was curetted at that time. A leucorrhea which had been present for years was improved by that curettage. She saw this same physician in July, 1910, who prescribed milk of magnesia and alkaline douches for a possible overacidity of the cervical secretions.

She had been using this alkaline treatment until coming to me. I found that she had some red everted mucosa about the cervical orifice and only a slight amount of leucorrhea. She was cauterized on October 17, November 7, and December 5. On December 27 the husband wrote that his wife

was eleven days overdue with her period. She gave birth to a seven-pound daughter on August 11, 1911.

There was so little leucorrhea in her case that I failed to see why the cautery should help her, and explained this to her frankly. She lived near New York City and her anxiety for children may well be imagined from the fact that she chose to make this long monthly trip in spite of my pessimism over the prospects.

Case V.—Seen November 14, 1910; aged thirty-two years; married five years. Menstrual periods regular—one and a half to two days' flow, with considerable pain in the back since her marriage. Before marriage the menstrual periods lasted four days; since marriage, two days; at times some pain on coitus; she never experiences sex pleasure.

The pelvic organs seemed normal except for a fairly large retention cyst in the posterior lip of the cervix. The patient had been operated on one year after marriage, having dilatation and curettage.

I cauterized the cervix November 14, and December 5, 1910, and again on June 15, 1911, when the patient returned still complaining of a slight leucorrheal discharge, especially on exertion. On April 7, 1912, she had a premature delivery of a normal, viable female child. The delivery was necessitated because of threatened uremia. This was an impregnation taking place within one or two months of my last cautery treatment after five years of sterile married life.

Case VI.—Aged twenty-one years; married thirteen months. Consultation January 4, 1912, concerning excessive leucorrhea and the desire to become pregnant. The cervix was two or three times normal size. The mucous membrane of the external os was soft and everted over an extensive area. After ascertaining that this condition was not due to gonorrhea and first treating the patient with douches and tampons, the cautery treatments were begun March 14, 1912, and continued until August 22, when the patient had her fifth treatment. The tissues of the cervix at that time

appeared almost normal. The patient became pregnant shortly after this last treatment and gave birth to a normal child.

The following nine cases are reported as pregnancies in which the cautery had a favoring or determining influence. I do not feel as certain about the cautery being the sole determining factor in relieving the sterility, because some of these patients had already had children and some of them had been married too short a time to be placed in the sterility category. In others I had operated fairly recently or had recently corrected a malposition, using pessary and tampon in association with the cautery treatment.

Case VII.—Aged thirty-three years; has one child five years of age. Dr. Kelly operated for complete tear of the perineum four years ago. Two years ago she began to have much leucorrhea and soreness in the genital tract. Douching controls this condition, except when she is subjected to overexertion.

Examination showed excellent result of complete tear operation, but considerable relaxation in the upper vagina, and hypertrophy and descensus of the cervix. The cervix contained many Nabothian follicles, and was covered by a profuse discharge. The cautery was used on September 10, October 1, and October 22, 1903. Her last menstrual period before having a child occurred September 24. Her child was born during the first week in July, 1904. She therefore got pregnant either after the first or second cautery treatment.

Case VIII.—Aged twenty-eight years; married eight years; II-para, aged six and one. Last child died in four days and patient is extremely anxious for more children. This last child weighed sixteen pounds, and the delivery was difficult, the child's arm being broken.

Since the last delivery the patient has had the usual symptoms of relaxed vaginal outlet.

Operation June 15, 1909. High circular amputation of the

cervix; dilatation and curettage; oval denudation of the anterior vaginal wall. Posterior wall repaired, bringing the levator muscles over moderately.

The patient gives an interesting marital history. She says that after the birth of her first child she never had sexual pleasure on coitus, although her sexual desire for her husband during the daytime was always active. During all of this time she had had night dreams about once a week or oftener. These dreams end in a marked sexual explosion, and there is much discharge of mucus. She is weak and feels good-for-nothing for a day or two after these explosions.

She never had these night dreams before marriage, and never practised masturbation.

After the operation the sexual dreams occurred less often, but she still experienced no active pleasure in coitus. The patient failed to get pregnant, and on February 6, 1911, I examined her and found that there was considerable eversion of the cervical mucous membrane and considerable leucorrhea. I cauterized the cervix thoroughly with four deep strokes on February 6 and with five moderately deep strokes on February 27.

The patient came again October 5, 1911, and said that she had lost the record of her last period, but that she had felt life on August 19. This brought her impregnation within one or two periods after the last treatment. She was referred to Dr. Dobbin, who delivered her of a normal child at term.

Case IX.—Aged twenty-eight years; consulted me July 8, 1909, concerning a profuse leucorrhea, dull, heavy backache and shooting pains in the pelvis, particularly at the time of the periods and on exertion.

These symptoms dated from the birth of her only child, now two years of age. She was anxious to again become pregnant.

The patient was of the frail type, with atonic tissues in general, and had a moderately relaxed outlet with a slightly prolapsed uterus, showing exaggerated anteversion and

flexion. The cervix was rather low in the vagina, considerably enlarged, and showed everted cervical mucosa and over the vaginal portion many small eroded plaques. There was profuse leucorrhea.

She was cauterized July 8 and August 5, and did not return until October 11. She then had less leucorrhea and the cervix was much smaller than at first. The uterus was in a better position, and the patient said that she had but little of her dragging backache.

She had developed a new symptom in the form of more or less constant nausea for the preceding month or two. On cauterizing the cervix, several rather large cervical glands were emptied of their glairy mucus. She returned on December 24, reporting an abscence of nausea since the last treatment, very little leucorrhea, and the back feeling much stronger. Examination showed considerable reduction in size of the cervix, and the eversion of the mucosa having entirely disappeared. The fourth cautery treatment was given, emptying a few small cystic glands.

The patient became pregnant in about seven months, and gave birth to her second child in April, 1911, and early in 1913 she returned for three cautery treatments, which again returned a somewhat enlarged and congested cervix to an apparently normal condition.

Case X.—Aged twenty-three years; married fourteen months; had one spontaneous miscarriage, an eleven weeks' fetus, six months after marriage. Consulted me May 5, 1910, for obscure abdominal symptoms which seemed most likely to come from a chronic appendicitis.

I operated on the patient December 22, 1910, removing an inflammed appendix and a walnut-sized dermoid cyst from the outer pole of the right ovary. The patient had been extremely anxious to become pregnant, which was my excuse for conserving the normal portion of the right ovary. The cervix was also dilated. During the next five months I saw the patient rather frequently, because of pelvic pain

and irregularity of her periods. This pain occurred first on one side of the pelvis and then on the other, and retention ovarian cysts were found on alternate sides of the pelvis, probably accounting for the irregularity of the periods and the pain.

On June 5, 1911, the patient complained of much pain in the left pelvis with her last period and much leucorrhea for two weeks after her period. The left ovary was twice normal size and cystic and the right ovary was of normal size. The cervix was rather large and soft and was discharging considerable glairy mucus of acid reaction. A thorough cauterization was done.

The patient returned again on July 6, saying that her last period was due June 23 and had not yet appeared. She was delivered of a full-term male child on March 2, 1912.

It is a question in this cases whether the patient became pregnant before or immediately after this cautery treatment.

The question also arises as to whether her sterility had been due to the condition of her cervical secretion or to the interference with normal ovulation on the part of the alternately cystic ovaries. In this latter case the use of the cautery and impregnation had no causal relationship.

Case XI.—Aged twenty-five years; married sixteen months; menstruation usually regular, moderate, two-day flow; no local pain, but terrible pains through the eyes and head.

The patient came because of her anxiety to become pregnant, stating that her husband was the last male in his family. The pelvic organs were apparently normal. The cervix showed a little redness and slight granulations about the orifice but there did not seem to be an excess of leucorrhea.

She was cauterized on September 22 and October 20, 1910. Her last period occurred October 2, and this was only a scant show, lasting less than one day. I examined the patient on November 17, when the uterus seemed to be six to eight weeks pregnant.

On June 4, 1911, she was taken with convulsions and her physician made a forcible delivery of a male child, which he considered somewhat premature. The child is living and is well.

If this was an eight months' child the impregnation must have occurred just before or just after the scant October 2 period, which was within two weeks of the first cautery treatment.

Case XII.—Aged twenty-eight years; married seven years; seen February 3, 1911. Has had three children, weighing respectively fourteen and one-half, sixteen, and eleven and three-quarter pounds. Only the first child, now six years of age, is living, and the patient is anxious to again become pregnant.

The last baby was born September 11, 1910, since which time the patient has never menstruated. The uterus is of amenorrhea size, the cervix somewhat enlarged and shows stellate laceration. The cautery treatment was begun in the hopes of ridding the patient of a profuse leucorrhea and to make her feel that something was being done to favor pregnancy, as she was in a bad mental condition concerning this point. The cautery was used on February 23, March 23, April 20, and May 18, 1911. I then referred the patient to a general practitioner, and saw her again November 16. She reported having menstruated one and one-half days about August 1, and had had no menstruation since. The uterus was then of about two months' size and she was delivered of a normal child June 1, 1912.

Case XIII.—Aged twenty-six years; married five years; one child, three years of age.

The patient consulted me January 8, 1912, for painful menstruation, backache, and general ill health.

I found a much relaxed outlet, hypertrophy and inflammation of the cervix, and the uterus large, very tender, and in extreme retroposition and flexion.

The patient was first treated by having replacement of the

pelvic organs and a pessary to hold them in position, and was given tampons and douches. The cervix was cauterized February 1, February 15, April 11, and May 9, 1912. Her last period occurred June 28 and her baby was born March 11, 1913. I operated on the patient for acute appendicitis on October 1, 1912, when she was about four months pregnant.

Case XIV.—Aged twenty-four years; married one year; consulted me January 30, 1912, because of dysmenorrhea, and to know whether she could become pregnant. She had been operated on two and one-half years before for appendicitis, and had a suspension of the uterus, and at this time was told that her pelvis was small and she could never have children. The uterus was found lying far back in retroflexion, and the cervix was near the outlet and presented considerable granulations.

The patient was cauterized on February 1, and February 19, after first bringing the uterus in position and holding it with a pessary. The last menstrual period occurred March 11 and a baby was born in December.

Case XV.—Aged thirty-three years; married nine months; leucorrhea rather profuse and strongly alkaline. Cervix somewhat everted and granular looking. One cautery treatment was followed by but one period. The patient was delivered at about eight months by Cesarean section, necessitated by hemorrhages due to placenta prævia.

I report among the failures to become pregnant after the cautery treatment only those cases (nine in number) who have previously had miscarriage or children, or whose husbands have had children by a former wife or presented semen showing active spermatozoa. Azoöspermia is the cause of sterile marriage in such a high percentage of cases that no method of treating the wife can have its merits passed upon without first excluding the sterilities due to the husband.

Mrs. C., aged thirty-three years. March 7, 1908, treated for pyelitis, probably gonorrheal, and at that time she had subacute pus tube on the right side.

Returned four years later for four cautery treatments of the cervix in hopes of pregnancy. Failure.

On the first visit the patient had one child, four and one-half years of age, and her gonorrhea had been acquired about one year before I saw her. It is quite possible that the other tube (left) had been obstructed by the gonorrhea, although it was not palpable.

Mrs. K., aged thirty-one years; first seen March 4, 1910, because of an acute colon bacillus pyelitis and cystitis. A year later the patient began cautery treatments for her cystic cervix and leucorrhea, and in hopes of becoming pregnant. Five cautery treatments were given over a period of one year, restoring the cervix to a normal appearance and curing the leucorrhea, but the patient has not become pregnant.

She had one child, five and one-half years of age, at the time of her first consulation.

Mrs. McK., aged twenty-two years; married four years; was first seen October 17, 1910, when she was dilated and curetted because of dysmenorrhea, menorrhagia, and the desire to become pregnant. Examination of the scrapings showed some glandular hypertrophy.

The cervix was rather large and inflamed, and there was some question as to whether the fundus contained a small fibroid in its anterior wall.

In May, 1912, another gynecologist dilated and placed a stem pessary, which came out into the vagina within a week. In the past eighteen months the patient had had six cautery treatments without becoming pregnant. The husband's semen is apparently normal.

Mrs. J., aged thirty-one years; married four years; consultation November 17, 1910. Menstrual history and pelvic examination apparently normal. The patient had a dilatation and curettage three or four months after marriage and had less painful menstrual periods for two months. She states that her genital canal is small and that coitus always

gives pain. The cervix is found to contain a number of large cysts. Five cautery treatments within six months greatly improved the appearance of the cervix but there were still some small retention glands. The patient had not become pregnant. The husband's semen shows motile spermatozoa.

Mrs. W., aged twenty-nine years; married four years. Operated nine years ago for appendicitis and four years ago for retroversion, having a Gilliam suspension. Husband's semen normal. The patient had four cautery treatments within one year, which reduced the size of the cervix and the amount of leucorrhea. The discharge also became less acid, but the patient has failed to become pregnant.

Mrs. B., aged twenty-nine years; two previous operations of dilatation and curettage. Two cautery treatments; no pregnancy. Husband's semen motile.

Mrs. T., aged thirty years; married nine years. One child two years of age; six cautery treatments; no pregnancy.

Mrs. G., aged thirty-seven years; married two years. Husband had seven children by first wife. Three cautery treatments; no pregnancy.

Mrs. J., aged twenty-eight years; married seven years; one miscarriage; five months' fetus three years ago. Four cautery treatments; no pregnancy. Myoma (?) of fundus.

As an illustration of the danger of jumping to a false conclusion in dealing with a subject with as many complexities as those presented by sterility, I should like to cite the case of a woman who gave birth to her first child in August, following three cautery treatments in January, February, and March.

Mrs. D., aged twenty-six years; married six years; consulted me January 20, 1910.

The patient had her first menstrual period at sixteen, and then had periods at intervals of six months to a year up to the time of marriage and ever since.

She states that she had the uterus dilated one year ago, and after this had her menstrual periods three months in

succession, the first period lasting for seven days and the next two periods progressively less. Her last period before this series of three was one year previously, and followed six weeks after a similar operation, the period lasting six days. Sexual intercourse seemed to be normal, and examination of the husband's semen showed apparent normal conditions.

I found that her sexual organs seemed to be normal, except for scars on the cervix from former operations and two or three swollen cervical glands. I cauterized the cervix on January 20, 1910, on February 21, and on March 14. On the first date, January 20, I made a note that the uterus was of normal size and position and that the adnexæ were not outlined because the patient was so stout. I did not make a note concerning the size of the uterus on the subsequent treatments, and was not concerned about the patient's amenorrhea because of her past history in this regard. It was with no little surprise that I heard of the birth of a full-term child about Agust 10, 1910.

Had this childbirth occurred two or three months later I would have been justified in considering that the cautery treatment had influenced the pregnancy, although the irregular menstrual history was such as to make any conclusion somewhat questionable.

Another case to illustrate the danger of arriving at false conclusions is that of Mrs. B., aged twenty-eight years; married five years, who came to consult me concerning dysmenorrhea and sterility.

Dr. Finney had operated when she was thirteen years of age for a severe appendicitis, and it was thought that she could not recover.

I found a long scar in the lower right quadrant of the abdomen, showing some tendency to hernia. The cervix was large and soft and showed everted red mucosa from which exuded considerable mucin looking like egg albumen and possessing an alkaline reaction. The uterus was of normal

size, rather fixed in the pelvis by thickening of the uterosacral ligaments, and the uterus and adnexa were apparently drawn back in the pelvis by adhesions.

My conclusions at this first examination were that the patient had probably had severe pelvic inflammation with her appendicitis, and that she probably needed an operation to free the tubes and to bring the uterus into position in order to relieve her dysmenorrhea and make pregnancy more probable.

The patient first consulted me February 28, 1913, and she had menstruated on February 20. I did nothing on this first visit except to make a thorough examination and attempt to replace the uterus. She called upon me again March 24, and reported that she was eight or nine days overdue. I saw her again April 14, when the uterus was apparently of two months' size, and occupying a good position in the pelvis. She was examined again on May 22, when the uterus was of about three months' size and there was no palpable evidence of pelvic inflammatory trouble. The patient was then referred back to her family physician who reported the birth of a baby about December 1, 1913.

Had I used the cautery at her first visit I would have classified her in my list of pregnancies induced by the aid of the Paquelin.

DISCUSSION

Dr. Henry T. Byford, of Chicago.—I must confess that I am a little surprised at the suggestion of such a vigorous use of the Paquelin cautery upon the cervix for the cure of sterility. Such cautery must act by destroying a large part of the mucous membrane and by replacing it with scar tissue. This would not leave an ideal cervix for the passage of a fetal head, although I suppose that the head would find a way of getting through. When I cannot cure a case by less heroic treatment than that I prefer to remove the affected mucous membrane after the manner of a Schroeder trachelorrhaphy.

Dr. Herman J. Boldt, of New York City.—I believe that we are all clinicians, and that practical subjects frequently draw forth more interest than purely scientific ones.

I have been acquainted with the Paquelin cautery treatment for endocervicitis for some time, but I fear to use it, and the purpose of my remarks is to get some information.

I fully realize theoretically that the point brought up by Dr. Byford is well taken. There is no condition with which I am acquainted which is more obstinate than one of these chronic cases of endocervicitis, where it is at the base of an old gonorrheal infection. They go on for years, and I do not know what to do for them. I get tired of them. I relieve them, and then they get renewed trouble again.

The point I desire to inquire about is, what is the risk of getting subsequent atresia of the cervical canal? With the old Byrne operation for carcinoma, I have seen several cases where I did a hysterectomy subsequently, because of atresia. The question has entered my mind of what is the danger of getting subsequent stenosis of the cervical canal?

A second point is: Is it not as well and more convenient to use the ordinary galvanocautery with a small platinum knife than the Paquelin cautery? It seems to me, there is less risk of burning. These are the features I desire to inquire about.

Dr. George H. Noble, of Atlanta, Georgia.—I made some use of this method of treatment years ago when it was first presented to the profession. At that time facilities for cauterization were not as good as they are now; the treatment, therefore, was not as thoroughly and effectively done. After Dr. Hunner read his first paper upon this subject I again adopted the treatment. However, I do not use the Paquelin cautery nor destroy the entire mucous membrane, but in place of the Paquelin have employed a platinum wire loop as a cautery electrode. It is similar in shape to the instrument used by the rhinologist, but is much heavier and burns deeper.

I find that by burning about a half a dozen lines in the long axis of the cervical canal, leaving a quarter of an inch of mucous membrane between lines, that I secure good results. Many cases do not require a second application.

If the cauterization is thorough it should go through the mucous membrane to the muscular structures of the uterus, and extend up the cervical canal well above the diseased area, to the internal os if necessary. Succeeding applications should not be made until after thorough healing of the burned surface.

The treatment is especially useful in chronic gonorrheal infection and in eversion of the cervical mucosa. Extensive eversions under influence of it will retract within the external os, leaving a perfectly normal appearance.

In the way I use the treatment there is no tendency whatever to stenosis nor are there other serious objections. It is a very simple thing, and causes but little pain, and requires no anesthetic whatever.

I would like to add that the effect of the heat extends into the tissues beyond the burned area, and has a beneficial effect upon the cervical glands a short distance on either side of the lines of incineration. The glands so effected perhaps may also be destroyed, of this I am not sure for I have made no investigation.

Dr. Hunner.—I have had occasion to amputate the cervix occasionally in these cases, and the glands are destroyed.

Dr. S. M. D. Clark, of New Orleans, Louisiana.—I remember very well Dr. Hunner's first paper on this subject, and at the time it struck me as being a good thing, but I was afraid of stenosis, but gradually, as he constantly hammered upon it, I took renewed courage and began to use it with a great deal of skepticism. As I witnessed the good results, I changed from a skeptic to an advocate. I have not had a very extensive experience with it, but in those cases in which I have seen fit to use it, the results have been excellent. I have not seen any of the things of which I was originally afraid.

Dr. Thomas S. Cullen, of Baltimore, Maryland.—In 1897 or 1898 I reported in the *Maryland Medical Journal* the results of our examination of the uterine mucosa in all cases operated upon in the gynecological department of the Johns Hopkins Hospital during the preceding four years. This material included all scrapings, the endometrium in cases where double pus tubes existed, in fact, every piece of uterine mucosa that was sent to the laboratory.

I was surprised to find endometritis of the body present on an average of about once a month. In other words, we found definite endometritis only forty-eight times in four years in a gynecological clinic offering an abundance of material. We as gynecologists have in the past used the term endometritis in a very loose manner applying it to simple conditions of the endometrium where no evidence of inflammation existed.

I would like to ask Dr. Hunner concerning his experiences

with abscesses of Bartholin's gland. Bartholin's gland is made up of one large and many secondary ducts and these in turn open into many little recesses or pockets—the glands. Consequently when Bartholin's gland becomes infected numerous isolated abscesses may develop and the opening of one will not necessarily ensure the satisfactory evacuation of others.

Dr. I. S. Stone, of Washington, D. C.—Dr. Cullen spoke in regard to the Bartholin glands and as to the large size of them. If Dr. Noble, Dr. Hunner, and Dr. Clark, are correct there is no pain. Possibly the women in Washington are more sensitive than they are in Baltimore and in New Orleans. It is my experience that the Paquelin or any cautery applied to the cervix is felt by women in Washington.

As to the use of the cautery, I have not tried it. Suppose we have a serious enlargement of these follicles in the cervix, if we can get the patients to come back to the office at intervals, I do not see why we cannot cure them in other ways, but we cannot get these patients to come back to the office indefinitely for treatment, they will become restless and are apt to go to someone else. If we are going to take three or six months to cure a patient of chronic cervical endometritis, we had better resort to some other method of treatment. There are some patients who will demand another way. If we destroy the glands, why not make a little operation, split the cervix wide open just as you would prepare for a trachelorrhaphy and cut away the glands; let us destroy the cervical tissue at once and leave a strip of undenuded tissue which has been curetted, bring back the cervix and sew it up. That cervix will be as elastic as any of those after ordinary trachelorrhaphy. It will be free from cicatricial tissue which will interfere with pregnancy or delivery. I must say, I would hesitate to treat the Bartholin glands as suggested. I have had to dissect out some of these glands. They are like a bunch of grapes; they are retention cysts, and I do not understand how we can practice this slow method for curing them successfully.

Dr. Henry O. Marcy, of Boston, Massachusetts.—I am reminded of a long discussion of this subject at the International Medical Congress held in London in 1881. Dr. James Henry Bennet, of London, had published a treatise on "Inflammation of the Uterus, its Cervix and Appendages" which was so favorably received that it ran through four editions.

The lacerated, everted, greatly hypertrophied cervical

structures complicated by obstructed glands—the then so-called ulcerated, inflamed neck of the uterus—were one of the most common conditions seen at all the clinics.

Simple as it now appears of diagnosis, it had not occurred that these changes were due to a structural lesion and hence the long and tedious treatment inaugurated by Dr. Bennet and generally practiced by his followers. Not seldom serious results followed, and at one period I thought I could often determine the practitioner who had treated the patient from the resultant loss of tissue adhesion.

During the session of the Congress Dr. Bennet came under, as I thought, much too severe criticism and I insisted that he could not be held responsible for injudicious following.

It is well known that the surgical restoration of the cervix uteri is an American operation devised by Drs. Sims and Ernest.

Dr. W. S. Playfair, of London, in the discussion of the subject reverting to the long-continued and imperfect treatment by caustics, stated in a playful way that he had for a long time a duchess under treatment who was worth to him one hundred pounds a year. She visited America, fell into the hands of the Phillestines of New York, and by a comparatively slight operation was cured.

Dr. Hunner (closing the discussion).—With reference to the point of stenosis which was referred to by a number of men taking part in the discussion, that loomed very largely in my own mind when I first began using the method. There is nothing original about the method. Formerly in these cases we took the knife and opened the retention cysts with radial incisions, and by a later method we took the cautery and seared it over the surface of the cervix and the entire external os. These patients were cured of their leucorrhea for about a month, and after that time they were just as bad as ever, so I combined these two ideas and made radial incisions with the cautery and Dr. Noble I think, has clearly explained to you what happened. You do leave considerable normal tissue between each of the radial sloughs. There are few of these cases that need more than three treatments, and there is plenty of normal cervix left. It is astonishing how much one treatment will do for some of these cases. After one treatment the patient will get rid of a great amount of leucorrhea. The everted cervix is drawn in, and you are surprised how well it looks at the second visit. The old gonorrheal cases take from four

to ten treatments. You will notice from my list I have had the best statistical results with these cases. There is a bigger percentage of apparent cures than of the other cases, because in my results I have put those down as cured that I have seen and followed. Many of the other cases I do not see again after the first treatment. I put them down as improved unless I am informed they are cured. The old persistent gonorrheal cases have become tired of other methods, but after the first two or three treatments with the cautery they are so much better that they persist in coming until dismissed as cured. There is occasionally a case attended with endometritis in which we cannot get rid of all the leucorrhea.

Regarding stretching of the cervix and alkaline treatments for these cases in which you wish to favor pregnancy, two or three of my pregnancy cases had dilatations and curettages before I saw them, and one had several months alkaline treatment in addition to the operation, and after three cautery treatments she became pregnant. She had been married four years without having been pregnant.

As to the subsequent atresia, nearly all of these women have become pregnant and have been turned over to the family physician or to some obstetrician, and I have secured reports about the labor afterward, and in no case have we had any reason to believe that there was any interference whatever with labor. You cannot always report such results after high amputation of the cervix. This is office treatment for cases where there is no other need for an operation. If I am going to do an outlet operation or operation for suspension of the uterus, or put the patient under ether, rather than have her come to the office three or four times for treatment, I do high amputation of the cervix, and I am satisfied that the results so far as atresia goes, are satisfactory, but I have seen many cases of atresia that have been operated on by others. There is far less danger of atresia in the proper use of the cautery than in high amputation of the cervix.

Another thing: I have amputated a part of a number of cervices in which I have apparently got all glandular tissue which furnished the leucorrhea, and yet these patients came back later for one or two cautery treatments to get rid of the leucorrhea.

As to the question of Dr. Stone, regarding the Bartholin glands, I have treated only three cases at the office, but I have been perfectly satisfied with the treatment.

CHOLECYSTECTOMY VS. CHOLECYSTOSTOMY

AND A METHOD OF OVERCOMING THE SPECIAL RISKS ATTENDING COMMON DUCT OPERATIONS

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In reviewing the records of 832 operations on the biliary tract performed at the Lakeside Hospital by my associates, Dr. Bunts and Dr. Lower, and myself together with those performed by other surgeons at the Lakeside Hospital, we find that cholecystostomy presents rather too frequently a history like the following: For a time the wound remains quiescent, then there is some fever and pain—the old familiar pain—associated with a sense of pressure and burning at the scar, which reddens, swells, becomes tender, raised, and after several days by opening allows the escape of mucopus, perhaps bile. Immediately the symptoms disappear, and after a short period of drainage it closes. After an indefinite period this cycle repeats itself. It does not satisfy or content the victim of this cyclic gall-bladder to assure him that this is a safety-valve, that no possible danger attends it, and that some day he may get well. He replies that he suffers keenly, that his work is broken into, that he is handicapped and wishes to be rid of trouble. This means cholecystectomy, which uniformly gives relief.

Such cases present to us definite clinical problems, viz.: Can it be determined at the time of operation whether a given case will eventuate in this malevolent cycle? Is cholecystectomy followed by any noxious after-effects?

Will the mortality rate of cholecystectomy be greater than that of cholecystostomy in the cases that will be followed by the cycle of cholecystitis, eruption, quiescence? From the local conditions one can with considerable accuracy forecast the clinical behavior of the gall-bladder and the cystic duct This prediction, however, is subject to modification on two principal accounts: the technique of the operation, and the after-care.

Conditions Which Point to the Cholecystitis Obstruction Cycle. If the mucous membrane of the gall-bladder be gangrenous, if there be a stone embedded by ulceration in the cystic duct; if the wall of the gall-bladder be thickened by scar tissue as a reaction to infection, and if there be no bile in the gall-bladder, these conditions usually will be followed by recurrent obstruction and infection. On the other hand, if the gall-bladder have approximately normal walls, and if the cystic duct be approximately normal, then no matter what the size or the number of stones, if the operation be performed with gentle manipulation so as to avoid any unnecessary trauma, there will be no postoperative pathologic cycle. Too much stress cannot be laid upon the necessity of gentle manipulations in the performance of the operation. What would happen to the urethra if a clumsy hand attempted to guide into the bladder a metal catheter or sound which had become corrugated by age and neglect? Or what would be the result of forcibly stuffing rough gauze into the urethra, so as to cause copious bleeding. The urethra would swell, become infected, obstructed, and later, perhaps, strictured. The base of the gall-bladder and of the cystic duct resent no less the bruising and wounding of their mucous membranes by gauze or by instruments. Following such needless injury there my be occlusion by strictures, for the normal cystic duct is very small and is easily closed by stricture. Finesse can accomplish a more certain exploration and a more difficult extraction than can rough manipulation.

The Comparative Risk of Cholecystectomy and Cholecystostomy. In the cases in which cholecystectomy is indicated, the pathologic condition of the gall-bladder makes cholecystectomy safer than cholecystostomy, as the former obviates the necessity for prolonged drainage and limits the extent of infection, especially of infection of the incised wall. The mortality of cholecystectomy depends also on the technique. The gall-bladder should be exposed by an ample incision so that there may be free access to its base; the freeing and separation of tissue should be made by sharp dissection, care being taken not to cut into the liver, that bleeding and infection in that organ may be avoided. The entire gall-bladder should be freed from its attachment so that ample opportunity may be given for determining the exact place where the gall-bladder ends and the cystic duct begins, this being the point at which the division should be made. This technique causes but little reaction.

It is well to emphasize further the necessity of most careful determination of the exact point at which the division should be made between the gall-bladder and the cystic duct. If the division be made too high so that even a small part of the gall-bladder is left, there may result, as I have seen, the formation of a diminutive gall-bladder, with distinct cholecystitis, accompained by pus formation and the formation of small stones. If, on the other hand, the cystic duct be divided so near its junction with the common duct that the lumen of the latter is first narrowed by the pressure of the ligature, then totally occluded by swelling, this occlusion will usually be relieved by the subsidence of the swelling.

That there may be a correct division therefore, it is essential to have ample room for work, and to maintain a clear field.

In cases showing chronic infection without febrile reaction, the risk of cholecystectomy is less than that of cholecystostomy. On the other hand, in cases of acute cholecystitis with protective adhesions, in which the cystic duct is obstructed,

cholecystectomy will give a higher mortality than will mere drainage of the gall-bladder, for the reason that during the excision of the viscus, even with the most careful technique, it is necessary to traumatize the surrounding tissues to such an extent that the local immunity of the tissues is impaired. In such cases it is probably wiser to merely drain the gall-bladder, interfering with the local tissues as little as possible. Later, if necessary, the gall-bladder may be excised.

The clinical results of cholecystectomy in many cases of pathologic gall-bladder are clinically as much better than cholecystostomy as nephrectomy of a pus-riddled kidney is better than a nephrotomy. The convalescence after cholecystectomy is usually as uneventful as in convalescence after a salpingectomy for chronic suppuration. I have never seen any adverse clinical results following excision of the gall-bladder. It has been argued that the surgeon would be at a great disadvantage should there be later a necessity for operating for stone in the common duct. To this objection one may reply that the common duct occupies a fixed position with definite landmarks, and if a bloodless anatomic field be maintained by sharp dissection, the duct will be found easily, even though it be buried as deeply as possible under overlying adherent organs.

Common Duct Operations. Operations for stone in the common duct, however, even in the hands of the most experienced and expert operators, yield a high mortality rate as compared with operations on the gall-bladder, or with operations on the pelvic organs, for exophthalmic goitre, suppurative appendicitis, etc.

In the common duct operation no vital organ is involved but merely a duct. Deaths can rarely be attributed to the loss of bile or to infection of the peritoneum from bile but is due to the gradual development of an asthenic state, characterized by dulness of the mental and motor reactions, a dry tongue, partial suppression of bile, anorexia, scanty urine, together with the impairment of the entire digestive

system—a progressive adynamic state which is extremely resistant to any known treatment. All common duct cases by no means follow this course, but the severity of the post-operative symptoms is in proportion to the difficulty of the technique, which in turn depends upon the number of the stones and their impactions. My most impressive example of this mortal development was in the case of a fairly good risk patient whose entire common duct and a large part of the hepatic duct were impacted solidly with sixty-five stones. The task of extracting these was not difficult, and though my patient went through the operation splendidly, he died on the fifth day with the symptoms above mentioned. Neither infection, nor hemorrhage, nor shock, nor ileus, nor pneumonia, nor urinary suppression were accountable. What then did cause death?

A clue to the real explanation of this hitherto baffling sequence of common-duct operations was found just at this time in the following facts established by certain experiments on the ductless glands, which at the time of this patient's death were being carried out by me in conjunction with my laboratory associates, Drs. Austin, Sloan, and Hitchings. The liver performs its function in part through hormone action and in part through direct innervation. It is curious that for the performance of at least a part of its function the liver requires to have a simultaneous hormone and nerve stimulation. Now the nerve-supply of the liver is derived from the sympathetic system; the nerve fibres pass along the bloodvessels and the common duct. As the process of evolution has thus abundantly sheltered these nerves against injury until the present surgical era, they have not evolved physical quantities for their protection as have the peripheral nerves. It is well known that slight injuries will block the visceral nerves. It would appear, therefore, that in the course of the common-duct operation for stone performed by an operator who is unaware of this grave danger the nerve-supply to the liver will be more or less blocked traumatically.

If the block be light and the patient have sufficient endurance the temporary loss of liver function will be safely bridged; on the other hand, the more severe the trauma of the nerves the more completely will the nerves be blocked and the longer will that block last. This conclusion corresponds quite precisely with our clinical facts. It gives an adequate explanation of the unexpected death of my patient, and makes it evident that surgery has been riding rough-shod over a serious danger.

To obivate this danger as far as possible the following operation was planned: Gentle manipulations and sharp dissections are employed throughout, the whole operation being planned as so to subject the tissues to the least possible amount of trauma. A long, vertical, right rectus skin incision is made with an oblique incision at its upper end extending an inch or more across the upper abdomen, the skin along the line of incision having first been thoroughly infiltrated with novocain. The muscular tissues are then thoroughly infiltrated with novocain and the incisions carried down to the peritoneum. The peritoneum is anesthetized and opened. By sharp dissection all adhesions are carefully divided, the dissection being rigorously carried along the white bloodless hairline between the peritoneum and the adhesion. No bloodvessel ever crosses this dead-white line. The whole line of dissection being bloodless, every tissue is accurately identified and no sponging is needed. The stones are laid bare by an ample incision through the duct wall, and are picked out without injuring the duct mucosa. The duct is then closed with fine chromic gut and a French needle, just as wounds of the intestine are closed, provided, of course, that bile drainage through the ampulla or the gall-bladder is assured. If drainage of the duct itself is not required, an iodoform drain is placed near but not against the line of sutures. The pre-incision infiltrations with novocain prevent shock, while the sharp dissection and gentle manipulations have caused the least possible damage to the important portal nerves

and to an exceedingly vulnerable environment. As far as the operation alone is concerned, therefore, convalescence should be, and is, quiet and uneventful.

Conclusions. From the evidence of our cases I draw the following conclusions:

1. Considering all the later consequences of infection, cholecystectomy in the type of cases indicated shows less morbidity than cholecystostomy. In these cases the clinical end results of cholecystectomy are good; while in unsuitable cases cholecystostomy is followed by recurrent cholecystitis.

2. I have seen no adverse effects from cholecystectomy, provided that the division is made at the beginning of the cystic duct; that no gall-bladder tissue is left; and that the division does not at all encroach on the common duct. This technique can be readily carried out.

3. If acute infection be present, then in most cases cholecystostomy should be first performed, followed if required by a later cholecystectomy.

4. If the gall-bladder and the cystic duct are approximately normal, then the gall-bladder should be left, cholecystostomy being the operation of choice. If the gall-bladder be thick, contain much scar tissue, be shrunken, show chronic infection of the wall, be much impaired, if the cystic duct be partially or completely strictured, or if a stone be impacted in the duct, then cholecystectomy should be performed.

5. All gall-bladder operations, and specially common-duct operations, may be performed with a minimun of shock and discomfort by thorough nerve-blocking with novocain, by sharp dissection, and by gentle manipulation.

6. The principal causes of the higher mortality in common-duct operations are the damage done to the nerve supply of duct operations are the damage to the nerve-supply of the liver and the loss of bile salts. The sharp-knife dissection and the clean-cut ample incision into the common duct, with the consequent minimum nerve injury and minimum injury to the duct and its neighborhood, and in suitable

cases, the immediate closure of the common duct by suture, will immensely improve the morbidity and the mortality following common-duct operations.

7. The mortality rate in the 832 records studied for the purposes of this paper was $7\frac{4}{5}$ per cent. This mortality rate, as well as the postoperative morbidity, will be decreased with the application of the technical procedures described here.

DISCUSSION

Dr. Edward V. Ochsner, of Chicago, Illinois.—I want to draw attention to the point that, as usual, Dr. Crile is right in practice. The reason why these patients die is because they get cholangitis. The condition that Dr. Crile has described is a cholangitis, and it is because you do just exactly what he tells you not to do that you get cholangitis in these cases. I have seen these patients die, and since I have protected others by not manipulating the inflamed tissues unnecessarily they have not died.

Dr. Randolph Winslow, of Baltimore, Maryland.—I would like more definite information in regard to the white line referred to by Dr. Crile so as to get a clear idea of it.

Dr. Crile (closing the discussion).—There is really no reply to the remarks of Dr. Oschner. No one ever replies to him.

I expect to show further evidence along the line I have indicated. As to the question of the white line, I would like to say a further word or two about it. It is odd, but it is nevertheless a fact that, no matter how old the adhesion may be in the liver and gall-bladder, the bloodless zone is always exactly on the peritoneum. Apparently when adhesions are made the bloodvessels do not anastomose between the peritoneum and liver. If the assistant makes traction on a broad plane with a piece of gauze, one can see that the tense line between the liver and adhesions will look white. This white line is the fibrous adhesion between the liver and the viscus which is to be separated. If one passes a knife under that white line the division can easily be made; if there is the least departure from this line then there will be bleeding. If the division is confined to that line, the pulse of the patient will not change by a single beat.

HEREDITY IN BONE LESIONS, WITH THE REPORT OF AN UNUSUAL FAMILY HISTORY

By Joseph Ransohoff, M.D., F.R.C.S. (Eng.)
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From the moment that life was first created, heredity became the force which governs the world. In the strife which is now fairly on, for the better breeding of the human kind, the cognizance of all that heredity implies must direct the very action itself. To our profession, heredity and particularly that of morbid conditions, should be "as a breviary to the faithful; always open in front of us, to instruct us with all possible certainity as to the prospects of a given case as to its evolution, its termination, and its possible consequences, for the individual or his successor." Now, whereas the scientific study of heredity has progressed marvellously, the law of Mendel and the theory of Weissman are not yet proved for the human race. It is true that for certain deformities like polidactylism, for certain blood conditions like hemophelia, for night-blindness, diabetes, and for certain neurophaties, the routes of hereditary transmission are beginning to be disclosed. As Sir William Gowers has so well said, "Potential fallacies surround almost every inference that can be drawn. We can seldom look back far at preceding generations, and the future we must leave to those who may follow us."

Because it has been my unusual privilege to have been enabled to come in personal contact with morbid heredity

Mixed central sarcoma of femur with spontaneous fracture. Roentgenogram taken from specimen twenty-two years after amputation

through three generations of one family, I take the opportunity of presenting, in brief, the history of four patients of three separate generations.

Case I.—Mrs. M. X., aged sixty-eight years, was born in England, without any obtainable history of hereditary disease. Her husband, short of stature, had no hereditary pathologic history. He died of senility at seventy-nine years. One brother died of acute nephritis at forty-seven years. One sister of diabetes at the age of seventy years. The patient had been well until some four or five months before she came under my observation, in July, 1891. During these months she suffered severely from pains in the lower third of the thigh. They were supposed to be rheumatic. In attempting one morning to get out of bed she sustained a spontaneous fracture. At the site of this a tumor rapidly formed, for which an amputation was made. The patient died September 18, 1891, of pulmonary metastasis.

The specimen showed a mixed central sarcoma of the femur, with spontaneous fracture. This was before the days of radiography. Fortunately the specimen was preserved and has been *x*-rayed (Figs. 1 and 2). The disease was limited to about three inches of the lower third of the femur and stopped short of the condyles. The compact tissue and the medulla for two inches above the main tumor mass show alternating areas of bone-rarefaction and hyperplasia. On the surface the growth has completely surrounded the femoral shaft in the form of a ring two inches wide and encircling the line of fracture. With the invasion of the soft parts the myeloma evidently assumed the malignancy of the sarcoma group in general.

Mrs. X. had four children, two daughters and two sons. One of the daughters has remained single and well, except for a cystic disease of the breast. The second daughter is married and has three children, all of them are well.

Case II.—S. X., male, aged forty-eight years. Mother died as above detailed, of central sarcoma. In 1890 he con-

tracted syphilis, which was apparently cured by the treatment then in vogue. In January, 1899, he first complained of pains in the right hip and became lame. Being told that the condition was probably luetic, he submitted to a long course of treatment at Hot Springs, without benefit. Trips to various health reports failed to bring relief. When first seen by the writer the patient presented the following condition: In face and stature he resembled his mother. The right thigh is in moderate abduction and slightly flexed. Between the trochanter and the iliac crest is seen a distinct fulness which extends forward to the anterior surface of the thigh. The mass was evidently deep seated in its origin. A radiogram, which unfortunately has been lost, showed an osteosarcoma of the femoral neck which had invaded the trochanter, completely destroying it. Although an exarticulation at the hip was advised it was not urged. The tumor grew very rapidly, invaded the skin, and death from recurrent hemorrhages ensued in March, 1900, fourteen months after the onset of symptoms.

An autopsy was not permitted nor could a part of the tumor be obtained. Although this case was probably from the beginning, on account of its malignancy, a sarcoma of periosteal origin, the possiblity of its having been primarily a myeloma cannot be definitely excluded.

Case III.—J. X., male. Mother died of central sarcoma of the femur. Younger brother of sarcoma of the neck of the femur. More than ordinary family resemblance to mother and brother. There is no history of syphilis. Patient was in excellent health until he had passed his fiftieth year. He then developed a typical osteitis deformans, beginning with the bowing of both tibia. The femora followed next, and then the necks of both femurs. In the course of three or four years the spine became progressively involved so that in walking the upper part of the trunk was almost parallel with the floor. Locomotion became exceedingly difficult and was only made possible by the use of two heavy canes. The case was one of Paget's disease, osteitis deformans,

and ended fatally at sixty-four years. The immediate cause of death was nephritis.

Case IV.—F. X., female, born in 1888, came under my observation when she was a year old. The father died of osteitis deformans. One uncle and the paternal grandmother died of central sarcoma. The patient, who is now living, and twenty-five years old, resembles the mother very closely in stature, color, and facial characteristics. She has one younger brother and one sister. Both resemble the father. They seem normal in every way.

When the patient was six months old it was found that she could bear no weight on the left foot. An examination revealed a break in the lower end of the tibia and a slight shortening of the leg and foot. There was no other deformity. There had been no history of an injury. The manipulations were not in the least painful. All efforts to obtain union in the fracture by the ordinary means failed, and the limb could not be made to bear weight. When the child was four years old the affected leg was two inches short. The foot was shorter than its fellow and poor in its circulation. An operation was now performed, with a view in some manner of bringing the fragments in contact. The exploration revealed an intact fibula. The upper fragment of the tibia was bulbous and eburnated. The lower fragment was triangular, very atrophic, and terminated above in almost dagger-like point. At the operation the upper fragments were vivified and the lower firmly fixed in the medulla. This of course was before the technique of bone-grafting was far developed. The result was unsatisfactory. The *x*-ray taken when the patient was eleven years old showed that the operation had not improved the condition. It was much as it had been before the operation (Fig. 3).

Protheses of various kinds had to be resorted to. Without them locomotion was impossible. The radiogram taken two years later showed that the fibula had also broken (Fig. 4). The leg was a little over three inches short. Trophic changes in the foot, such as painful though superficial

ulcerations, made life so intolerable that when the patient was in her sixteenth year an amputation was made below the knee as a matter of election.

The pathologic nature of this case is a puzzle difficult to solve. Was it an unrecognized case of intra-uterine or intra-partum fracture? Was it a fracture at all or was it from the beginning an imperfect osteogenesis? I am inclined to believe that it was the latter, in view of the family tendency to bone lesions, and because the ordinary concomitance of intra-uterine fracture, such as bowing of the tibia, the amniotic scar over the fracture, and other deformities of the leg and foot were absent. Furthermore, the theory of imperfect bone genesis fits in with the remarkable tendency to bone lesions in the family.

In 20 per cent. of the cases of Paget's disease an hereditary tendency has been found to exist. In many of them death results from sarcoma developing in previously affected bones. Indeed, Paget's first case died of sarcoma of the ulna. There are ranking pathologists today who believe that the medullary bone sarcoma is not a sarcoma at all but only a variant of the fibrous osteitis, which so often ends in bone deformity. Therefore, in three of my cases similarity if not identity of the bone lesions must be conceded. In the fourth and last case the morphologic kinship, though undoubted, is not so clear.

I am safe in saying that in all these cases bone tissue was by heredity a *locus minoris resistentiæ;* a phrase little used during the last decades, in which the bacterologists pushed aside our theories of the causes of disease. But for many things we are forced to fall back on heredity. The *locus minoris* of our fathers is still the weak spot, only the modern experimental biologist calls it the "recessive." The future alone can tell how far-reaching was the study of that humble Augustinian friar, who in the little-walled garden of his cloister at Brunn, looked on the humble garden pea, with a higher thought than that if there were enough of them they made a good meal on Friday.

INFRACTION OF THE SECOND METATARSAL BONE—A TYPICAL INJURY.

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As a part of the general symptom-complex of weak or so-called flat-foot we very commonly encounter pain in the fore-foot, in the region of the metatarsal heads. When seen as a paroxysmal affection concerning the fourth metatarsal, in particular, we are dealing with the metatarsalgia of Morton. Very frequently, however, we are consulted by patients because of pain in the heads of the other metatarsals which is not of paroxysmal character but rather dependent upon the use of the foot in weight bearing. This may or may not be in the presence of other signs of yielding and strain in the foot mechanism elsewhere than in the metatarsal region, but the dependence of the pain purely upon the weight bearing function will cause us to ascribe the symptom to static incompetence of the foot. Under these circumstances we shall find that the most common seat of the pain is the second metatarsophalangeal joint instead of the fourth, as in Morton's disease. The joint is usually tender to pressure and frequently somewhat thickened. The well-known plantar callus is frequently seen; almost uniformly so in cases of long standing. I have often found thickening of such degree in the second metatarsophalangeal joint that I have sought for organic change in the radiogram; always without finding it, however, until I encountered Case I of the series which I am now reporting.

In this case I felt justified in the diagnosis of infraction of the distal end of the second metatarsal, a condition which I have thus far failed to find described in the literature.

During the past ten years I have encountered six cases of infraction of the distal end of the second metatarsl bone. I feel justified in speaking of it as a typical injury because in each of my six cases not only was the same bone end involved, but the conditions under which the patients presented themselves were very similar as was also the character of the trauma which produced the lesion.

Ten years ago the first patient in whom I recognized this lesion was referred to me by Dr. E. W. Mitchell, of Cincinnati. The patient was a girl aged sixteen years. She had been suffering from pain in the ball of the foot for about six months. The pain was precisely like that which we so often encounter in the metatarsophalangeal region in connection with static incompetence of the foot. At the time I examined the patient she complained of pain in weight bearing only. In attempting any unusual exertion, as in walking considerable distances, she was compelled to limp and the pain became severe.

The patient was quite sure that the condition dated from and was due to a game of tennis in which she "stubbed her foot." The pain was severe at the time; it was considered a sprain and she was able to be about the next day.

My examination disclosed a well formed and apparently strong foot. The metatarsophalangeal articulation of the second toe was thickened, on palpation, and very tender to pressure. Passive movement of this joint was very painful and accomplished by slight grating.

The *x*-ray, Fig. 1, showed quite clearly that the distal end of the second metatarsal had been crushed in, causing the articular surface to lose its curved outline. There was apparently a small loose body in the joint about 2 mm. in diameter.

The treatment consisted in applying a felt pad to the

FIG. 1.—Case I. Girl, aged sixteen years. Tennis injury of six months before. Infraction of second metatarsal with one small loose body. No arthrotomy required.

FIG. 2.—Case VI. Girl, aged fourteen years. Injury three months before. No loose body.

Fig. 3.—Case III. Girl, aged twenty years. Tennis injury one year before. Infraction of second metatarsal with two large loose bodies which required removal. There was marked grating during passive motion.

plantar surface of the foot by means of adhesive plaster, so that its anterior end was placed just back of the injured joint. In this case I also had a steel plate inserted between the layers of the sole of the boot in order to deprive the foot of the motion in the metatarsophalangeal joints in walking. I have not done this in my later cases.

The patient was able to walk painlessly without the pad within six weeks and has had no further trouble with this foot. The other foot has always been entirely normal.

I find it unnecessary to report each of my cases in detail as they have such great similarity except as noted below. Fig. 2 is from a girl aged fourteen years, in whom the injury was also received in playing tennis. The radiogram was made about three months after the injury. The injury had, however, been quite forgotten by the patient and was only recalled by my questioning on this point. There is no loose body in this joint and there was no grating on motion.

Three of my six cases have shown loose bodies in the radiogram and grating upon examination. In two of these three cases I was unable to give definite relief by mechanical support alone and therefore removed the loose bodies by means of an arthrotomy from the dorsal surface of the foot. This resulted in entire relief from discomfort and pain. Fig. 3 is from the second of these operative cases and shows two loose bodies of considerable size, one of which was attached at one place by means of a fine pedicle. This was also a tennis injury.

It is a noteworthy fact that in two of the six cases, no injury whatever could be recalled by the patient in spite of careful questioning on my part. In one of these cases operative removal of small corpora-libera was necessary. I have no doubt of the traumatic origin of these two cases.

Two of my cases were women below middle age, but the remaining four were girls under eighteen years of age In two of the six cases there was evidence of static incompetence of the feet. I have no reason to believe that this stood in

any particular relationship to the condition which is here described.

Having observed six cases of this character in my own practice there would appear little doubt that the condition which I have described is not extremely infrequent. It is very likely that the similarity of symptoms to those of weak feet has caused it to be overlooked. While those cases in which there are no loose bodies will be relieved by the use of the felt pad if sufficiently long continued, the contrary will be true of the other cases. The cases with loose bodies will require arthrotomy as a rule. As in my first case this may be unnecessary where the bodies are very few in number and very small.

It seems worthy of note that in my six cases only one foot has been the seat of this injury. While it is common enough to see only one foot effected in cases of metatarsal pain from static weakness the contrary is the rule. This would seem therefore to be a point of some diagnostic importance. Not a little interest attaches to the mechanism by which this injury to the foot takes place. Under normal circumstances the second metatarsal bone is slightly longer than the first. In the presence of a diminished power of toe flexion and especially of the great toe, it is apparent that forcible impact of the ball of the foot against the ground not sufficiently guarded by the flexor power of the toes will cause the distal end of the second metatarsal to bear the brunt of the blow. It seems likely to me that we have here the explanation of the mechanism of this injury.

THE OPEN TREATMENT OF FRACTURES

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It is not my purpose in this paper to discuss the relative merits of the two modes of management of fractures, open and closed. I am not proclaiming the superiority of either one over the other. They are not in any sense rivals for popular favor, since they are closely allied in the attainment of successful results. Neither one can replace the other. The open or newer treatment is not a usurper, but a tributary to the broad current of general good. No one is expected to adopt either method of treatment as a routine, but the wise course lies in the decision as to *when* the one or the other should be employed. I would approach the discussion of this subject by stating that anything I say in favor of the open method is not to be credited with a double meaning in that it might reflect upon the closed treatment. I also wish to classify some phases of the subject as settled and therefore not debatable. They are thus eliminated from the analysis: For example, everyone knows that perfect functional results in fractures of the long bones is not incompatible with anatomic and cosmetic imperfections. We also acknowledge the fact as beyond dispute that the open treatment of fractures never will and never can become the universal procedure. The reasons are so obvious and numerous it would be unprofitable to name them. The real task before us is to aid in the selection of cases adapted to the open treatment and to stimulate interest in the devel-

opment of knowledge pertaining thereto. I am not prepared to follow Mr. Lane quite so far when he says that public opinion and the law courts will compel the adoption of direct fixation in treating all fractures. But one has only to study the literature of the last three years to become deeply impressed with the rapid advancement of the open treatment. Darrach[1] reports 104 cases; Blake[2] reports 106, and Bartlett[3] reports 80. There are twenty-five times as many articles in the literature as there was two years ago. F. W. Huntington,[4] in discussion, makes the statement that two years prior to the date of his speech only 18 per cent. of the leading American surgeons knew enough about the merits of the open treatment of fractures to discuss it, and now he finds on sending out a circular letter regarding this treatment that 95 per cent. of those to whom he applied agreed to the propriety and safety of the operative treatment of recent fractures in the hands of skilled surgeons. In 1911, at Denver, President Harte, of the American Surgical Association, in his presidential address called special attention to this subject.

These advances have been made since Mr. Lane read his first paper before the Clinical Society in London, in 1894, and in 1909 he read a paper before the American Medical Association that stimulated interest upon this side of the Atlantic. We know the question is agitating the surgical world at present as much if not more than any other subject. It cannot be arbitrarily dismissed or settled by any one man's experience or conclusions. It is a live issue and has been made so on account of the general average of results from the older methods of treatment falling below the mark of satisfaction. Whether it is the law courts, the *x*-ray, or surgical conscience that is the stimulus I do not know, but I do know there is enough of unrest to convince me that improvement in treatment of fractures is very much needed, and I believe the Lane plate offers up to now the most reliable device for direct fixation that is available.

In our consideration of the *open treatment* of fractures it must be clearly understood that the open method at present is a supplement to the closed, and in its present state of development is not a supplanting or rival measure. It is an amendment, not a substitute. Also, the open treatment of fractures and the treatment of open fractures are two separate propositions that are widely different from each other.

Despite having in Mr. Lane so powerful an advocate, I believe the open treatment would have languished, if not perished, had it not been for the lessons taught by fractures of the patella and olecranon. These injuries furnished examples of insurmountable obstacles to closed methods of treatment. Therefore, surgeons must perforce have persevered in their efforts to devise some direct means of fixation to meet the demands of such fractures. Again, some of the most formidable adversaries to the open treatment based their arguments upon their experience in the plating of compound and comminuted fractures and cases of non-union—the very conditions under which the plate is least apt to succeed.

The most favorable time for the operation is about a week after the injury. The most favorable cases are the *simple* fractures of the long bones. Probably the tibia or radius offers fewer anatomical difficulties than the other long bones. The most difficult object in the operation is to achieve the standard of asepsis required for this class of work. Even the gloved fingers must not touch the wound, nor anything that has touched the hand must be allowed to come in contact with the wound. This is certainly a most difficult feat to perform, and can only be accomplished by much practice and a high grade of mental concentration.

In the earlier history of the open method much discredit fell upon it by reason of the abiding faith held by many surgeons in the infallibility of chemical antiseptics, and later its popularity has suffered because of the failure of

some of its patrons to realize the extreme refinement of asepsis essential to success. I have lately seen the practise referred to as "a surgical aberration," probably by one who had failed to realize the importance of the details mentioned.

I have met with some difficulty in the operation in bringing the fractured ends of the fragment in perfect contact. It is the rule where the fracture involves a long bone to find a surprising amount of overlapping. It exists even in fractures of the tibia when the fibula is intact. Alignment can usually be achieved, however, by angulating the fracture outside the incision and buckling the ends of the fragments together. This manoeuver is much simplified by smoothing the fractured ends with a saw. In so doing we gain a broad surface for contact without sacrificing enough bone to interfere with functional or cosmetic results. The advantages of broad, smooth surface contact are important when concerned in the maintenance of alignment of fragments. One of the chief objects gained in this way is the certainty of bone against bone, or the elimination of that arch enemy of osseous union, the interposition of soft tissue. I have been much astonished at the revelations of the open operation, particularly the amount of injury done the soft parts by the jagged ends of the broken bone and the invariable presence of muscle or fascia or both impaled upon the sharp angles of the fracture. By sawing smooth the ends of the fracture, all this debris is removed *en masse*. In five cases of fracture of the tibia operated in this way I was fortunate enough to secure good results without using any external dressing except the usual gauze and bandage employed to protect the incision, and sand-bags laid along either side. From the elevation reached through this experience I can fancy the dawn of an era in which broken bones will be joined together and left in their natural environment, like a severed intestine is now united and dropped back into the cavity with a feeling of security.

The leaders in this work have not, so far as I know, so expressed themselves, but I verily believe their ideal is enshrined in the achievement of a method by which fragments of bone may be held in alignment entirely by an internal splint.

The phase of the subject which is of the most immediate concern is the selection of cases that demand open treatment. We shall not discuss in this connection the class of men fitted to perform open operations on fractures, but will attempt to consider the proposition in relation to the ordinary every-day surgeon. Let us first notice the contra-indications to the operation. It is not worth while to mention such obvious objections as improper surroundings or inability on the part of the patient to take anesthetics, etc. These conditions and similar ones are too well understood to necessitate discussion. Probably the strongest contra-indication that might fail to be considered is the presence of infection or infectious material. In one of my cases that ended in disaster there was a compound fracture of the tibia that suppurated and failed to unite. After I thought all the infection had disappeared and there was only a small sinus remaining, I attempted the plating operation with the final result that amputation became necessary. In recent compound fractures the weight of opinion seems against plating, but experience and judgment are very conflicting upon that point. Huntington[5] says in the next two years we are going to hear less said about placing foreign bodies in infected fractures. Darrach,[6] in a report of 10 cases of compound fractures treated by direct fixation, cites 4 results as "good;" 2 were lost track of; 1 failure; and 3 were fair. Bartlett[7] reports 5 cases—2 healed by first intention; 1 granulated over plate; 3 made solid union, though the plate had to be removed. Plating a recent compound fracture is therefore a matter of delicate judgment and one's course is largely defined by the peculiarities of the case in hand. If direct fixation is especially desirable, the

methods of Lillienthal, Parkhill, or Freeman should receive special consideration in compound fractures.

The next phase of the discussion relates to the use of plates in cases of non-union. It is held upon good authority that the presence of the plate acting as a foreign body serves to delay union (Jonas[8]) in recent fractures. The deduction follows that the plate would by the same token act more as a hinderance than a help in cases of non-union. Our only case was one of five years' standing and involved the femur. The plate had to be removed eight weeks after operation and there seemed to be perfect union at that time, but the patient had pulmonary tuberculosis and the union of bone dissolved before death, which occurred six months after operation. Martin[9] reports a case of radius and ulna fracture of the middle third of the shaft accurately plated more than a year, remaining clean and showing no union. "The long-standing ununited fractures and vicious union are those which are most difficult, and, in the case of the femur, dangerous." The internal splint is placed third by Martin in the list, for efficiency in treatment of non-union. I wish in this connection to quote from the report of a committee of the British Medical Association appointed to investigate the subject of treatment of fractures. In Article IX the report says, "Operative treatment should not be regarded as a method to be employed in consequence of the failure of non-operative measures, as the result of secondary operations compare very unfavorably with those of immediate operation. In order to secure the most satisfactory results from operative treatment it should be resorted to as soon after the accident as practicable." J. B. Roberts[10] reports a case in support of his contention that plating delays union, and points to reports of Darrach, Ashhurst, Freeman and others, as sustaining his position. The report of his own case, however, is not convincing. The question, therefore, will present itself in any given case of non-union whether it is better to expose the site of fracture, freshen

the surfaces, remove soft tissue and immobilize the limb in external splint or resort to some means of direct fixation. I am of the opinion that in such a case the use of the bone plugs of Murphy should prevail. Percy[11] reports 14 cases of non-union in 11 of which steel plates were used. Three cases of fracture of the neck of the femur were treated by the use of the long screw. Union took place in all cases. This experience certainly speaks well for plating for non-union.

Let us now look at the positive side of the question and consider what are the indications for the use of the plate:

1. *In fractures that cannot be reduced by ordinary manipulations.* Such a situation develops frequently in impacted fractures and in fractures where one fragment is very much shorter than the other and over-riding exists.

2. *Fractures that are difficult to maintain in reduction:* As in those where a process of bone is broken off; for example, a condyle of the humerus or the olecranon, and cases where the muscular attachment is so strong and the lines of force so directed as to pull the fragments apart, as in the femur.

3. Delayed union.

4. Where good cosmetic effects are especially desirable.

5. In fractures communicating with a joint where imperfect alignment or overproduction of callus is likely to seriously interfere with function.

The following is quoted from a report of American Surgical Association in *Surgery, Gynecology,* and *Obstetrics Abstracts,* August, 1913, p. 170:

"The troublesome fractures that may with propriety be mentioned as probable candidates for operative treatment are (1) Fracture of surgical neck of the humerus. (2) The fracture of the lower end of the humerus. (3) Fracture of upper third of radius. (4) Fracture of the ulna with dislocation of radial head. (5) Fracture of radius and ulna in shaft. (6) Fracture of upper third of femur. (7) Supra-

condyloid fracture of femur. (8) Fracture of tibia and fibula near ankle."

Mortality. In my own work there has been one death which occurred twenty-four hours after the operation, but which could fairly have been attributed to associated injuries. J. B. Roberts[12] collected reports of 9 deaths following operations. Blake[13] does not record a death in 106 operations. Bartlett[14] records 2 deaths in 80 cases. Darrach,[15] in 104 cases reported has no record of death. I feel assured, therefore, that mortality of the operation *per se* is a negligible quantity, especially if resorted to in the recent period after the fracture and performed under the proper restrictions.

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FRACTURE OF THE NECK OF THE FEMUR

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With all our boasted advances it must be admitted that the medical profession is very slow to accept of new methods. Every great advance has been met not only with indifference but too often with active opposition, from the days of Hunter and Jenner down to Lister. At the present time this characteristic slowness or indifference is well illustrated in the attitude of the profession toward improved methods of treating fractures of the neck of the femur. Although Maxwell, Ruth, Whitman, and many other writers have demonstrated the fact that fractures of the neck can be treated about as successfully as those of the shaft of the femur, our text-books continue to give a most hopeless prognosis, giving the same old reasons why bony union does not occur. They fail to accept the fact that bony union does not occur because the old methods of treatment, which they teach, do not bring the fragments in contact and hold them there. As long as the old methods of treatment are followed the prognosis is necessarily grave. It is difficult to understand why the profession is so reluctant to give up these methods, because they always were a failure that brought disgrace to the profession.

This strong language is used deliberately with the hope that it may rouse the somnolent members of the profession. The writer admits that he was intolerant and slow to accept the new doctrine, but now that he has seen the light, feels

that it is his duty to put forth his best efforts in behalf of the new doctrine to make amends for past failures.

Another time-honored fallacy connected with fracture of the hip is that it is found only in old people. Since Whitman reported his cases of fracture of the hip in children, many observing surgeons have seen them. Many cases pronounced coxa vara are really cases of "green stick" fracture of the neck of the femur. The average result after this fracture in children is better than in adults, not because of the difference in age, but because in children the fracture is usually of the "green stick" variety and the fragments are more or less in apposition, and because they are better treated.

The indications for treatment in fractures of the neck of the femur are the same as for any other fracture, namely, to bring the fragments into apposition and to hold them there. The reason for the failure of the old treatment is that it did not bring the fragments into apposition. Most fractures of the femoral neck occur in old people, but age is not the cause of non-union, for we expect good results after fractures of other bones in old people. The fact is that delayed and non-union usually occur in the middle-aged.

So much in this paper has been written over and over again by myself and others that I would not have the temerity to rewrite it were it not for the fact that the majority of the profession, and even of our teachers, have yet to learn how to obtain good results after fracture of the neck of the femur. The most astonishing fact is that many writers have taken the trouble to denounce the new treatment without having tried it, because they say the theory is wrong. Theory be hanged! It is results we are after. Many of my fellow practitioners in Minneapolis, St. Paul, and elsewhere, have tried it, and I know of none of them who have condemned it.

The difficulty in treating fractures of the neck of the

femur is in controlling the short fragment. There is no treatment that will always secure perfect results after any fracture, but the method advocated in this paper does bring the fragments into apposition and does secure bony union in a large majority of cases where the old methods are so uniformly followed by failure that many of those who practise them still believe that bony union is impossible.

The details of this anatomic method (as it was termed by Dr. Maxwell) have been published so often that it would be superfluous to repeat them. They can be found by referring to the attached bibliography. The principle is that by adding a side pull to the Buck's extension the resultant of the two pulls is a pull outward in the long axis of the neck of the femur. This renders the capsule of the joint taut and brings the fragments in apposition because the short fragment is floating loose within the capsule, being attached only by the ligamentum teres. This side pull is brought to bear upon the upper end of the thigh by means of a weight and pulley, the pulley being placed opposite the crest of the ileum of the injured side. It can be attached to the wall, a standard, or the side of the bed, and should be so adjusted that the pull is upward and outward at an angle of forty-five degrees. The amount of weight at the foot of the bed should be sufficient to overcome the shortening, and the side weight should be about one-third of the foot weight. I have depended upon the apparatus to adjust the fracture, but the advice of Ruth seems rational. He recommends that the thigh be flexed to a right angle with the body, with the patient on his back, and that extension be made directly upward while an assistant makes outward traction upon the upper end of the thigh, and that while both pulls are continued the limb is brought down parallel with the other leg and held in that position until the dressings are applied. A well-padded splint of surgeon's felt, or sole leather, should be applied to the inner and under sides of the thigh, coming well up to the perineum. This splint

is fastened to the thigh by adhesive plaster encircling the limb. This splint affords a broad surface against which the side pull can be made without chaffing or blistering. By means of the side pull the natural tendency to eversion can be overcome. I have found a band made of several layers of gauze or cheese cloth a convenient material for the side pull. It should be fastened to the splint by adhesive plaster so that it will not roll up into a cord against the perineum. To the ends of the gauze is attached a rope which goes over the pulley. By shortening the lower arm of this gauze the limb can be rotated inward, thus avoiding the danger of eversion.

In a child a healthy joint may be fixed almost indefinitely without danger of ankylosis, but in an adult ankylosis is a real danger. One of the advantages of this treatment is that the surgeon can slip his hand under the knee and flex it a little every day, and thus prevent ankylosis. The patient can be allowed, and should be encouraged, to sit up in bed. This can be done without causing pain or disturbing the fracture, because the head of the bone rotates in the acetabulum. The sitting posture adds to the comfort and convenience of the patient and prevents hypostatic pneumonia.

The object of this paper is to add my testimony to that of the other surgeons who have used this method in the treatment of fractures of the neck of the femur. During the thirty and more years that I employed the old method I had but one case in which the result was anywhere near satisfactory. Since 1903, when I first learned of this anatomic method from Dr. Ruth, a former pupil and assistant of Dr. Maxwell, my results have all been satisfactory except two. In one the patient developed a chronic rheumatism in the injured hip and a number of other joints. In one treated in the past year union failed to take place, but judging from my success in other cases I believe that this woman would have had non-union after a fracture of any

of her bones. It is useless to claim that this or any other treatment will procure bony union in every case, because there are persons who have not the bone-producing power. I have a specimen in which very firm impaction of the neck occured and still there was no bony union.

The surgeon who refuses to accept of the testimony of myself and others who have tried this method without trial, does himself and his patrons an injustice, because it will bring results where the old methods fail. I secured a very good result in one woman, aged sixty-six years, to whom I was first called four weeks after the accident, for up to that time the fracture had not been recognized. When a fracture of the neck has been neglected, or treated by the old method, which amounts to the same thing, and union has not taken place, there is still hope for the patient through an operation. I have operated upon one such patient who had been a helpless cripple for two years, and he is now walking on his leg. Cases suitable for this operation must be carefully selected. The patient must not be too old or too feeble to bear long confinement in bed. The proper patients for operation are those in good health who have failed to get union for want of proper treatment. It is useless to operate upon a patient who has not the power to produce osteoblasts.

This anatomic method is not the only method by which bony union of the femoral neck can be secured. Whitman's method of extreme abduction and retention by plaster of Paris will secure bony union, and is undoubtedly the best method for the treatment of children, but it is neither as comfortable nor as convenient as the anatomic method for adults.

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A WORD IN BEHALF OF THE OPEN OPERATION FOR THE PROPER FIXATION AND REPAIR OF FRACTURES, WITH REPORT OF CASES

By Frank Martin, M.D.
Baltimore, Maryland.

I have selected this subject of open operation for the proper fixation and repair of fractures, because I am more and more convinced that in the vast majority of fractures if they cannot be reduced by ordinary manipulative means, should unquestionably be gone down upon and the fragments brought in accurate approximation without delay. The day has gone by when we are justified in allowing a patient with a fracture of the femur, or, for that matter, any of the long bones, to be handicapped through life by a shortened member due to overriding at the seat of the fracture. During my student days it was always the rule to see a patient with a fractured femur recover with deformity and marked shortening; an inch of shortening was considered of no special moment, so the patient could bear weight on the member and hobble about as best he could. Today the public is demanding better results. They are not willing to be handicapped by a short limb or deformed member following any form of fracture.

And just here, let me say, I think we owe a debt of gratitude to Dr. Lane for having done so much in this domain of surgery. His work really should be regarded as an epoch making contribution to fractures; and his plate, known as the Lane plate, in my opinion is the best fixation device

certainly that we have at our command today. I do not mean to say that it is absolutely satisfactory in every way, but that as a method of fixation of general run of fractures it seems to me to be the best device we have. The ideal thing, of course, would be something in the way of a bony plate which could be incorporated with the callus and be converted into a living callus, but as yet such a device has not been worked out.

I, personally, have been for a long time going down upon and correcting fractures of the long bones, as well as patella and olecranon fractures, where I could not correct them by manipulation, extension, or what-not, by the use of other methods of fixation than is at present in vogue, namely, fixation by plates.

My views in the past have been that the least amount of foreign substance that could be used to bring about fixation was the method of choice; that is, if I could get the fragments in position and maintain them in position by the use of silver wire, I made use of that. I have many excellent recoveries among my records where this has been all that was necessary; but in some cases it was not sufficient as a method of fixation and some slipping or displacement would occur at seat of fracture, and then, too, I have not always been one of the eager advocates for the immediate operation in all fractures. I have felt that a man should have sufficient training in the method of reduction of fractures so that he could adjust broken bones, bring them end to end and maintain them in apposition by some splint which he knew best how to apply, and I believe today, that if a man is properly trained and taught how to reduce fractures and use splints in many cases he could bring about, by a thorough knowledge of fractures, complete restoration without open operation; and I don't today believe that every fracture should be cut down upon; but I do believe that if after careful efforts have been made under complete anesthesia and the correction of the fracture has not been per-

fect (which will be shown immediately following the efforts by an *x*-ray picture, the advances in which has made this work possible), then I believe if he has done the best he could and has failed to overcome the deformity, an open operation should be resorted to in all fractures of the long bones, whether they are near a joint, or away from a joint, or at any point in shaft where there is a solution of continuity. The only exception I make in this is the fracture of the lower end of the radius, namely, Colles' fracture. Here I do not believe one is justified in going down upon it, and I do believe that a recent Colles' fracture should be overcome by reduction so completely as not ever to need open operation.

Fractures of Both Bones of the Forearm. If fractures here cannot be accurately corrected while under anesthesia by careful efforts at reduction, they should always be gone down upon and plated.

Fractures of the Humerus. Most of the simple fractures of the shaft of the humerus can be corrected without the use of a plate unless it is low down near the elbow or high up near the shoulder, or unless there is evidence of involvement of the musculospiral nerve, or unless it is a compound fracture; in these cases they should be opened down upon and plated, whether the joint is involved or not. I have several illustrative cases in with this list of cases, showing complete restoration of function in both elbow and shoulder following fracture into these joints by resorting to open operation and plating the fragments. Case III is an excellent illustration; the elbow-joint was involved and I opened down upon it and fastened the upper end of the humerus to the lower end, and part of the plate extended nearly into the joint, but it fixed the humerus and restored the joint so that he had a perfectly functioning elbow, which he could not have had had I not gone down upon it. Likewise in separation of the epiphyses with displacement, I believe they should be dealt with by open operation.

Fractures of the Tibia. In fractures of the tibia I believe the open operation should be resorted to, and a method of fixation, either by wiring or plating, preferably plaiting (as it is much easier of application, much less difficult to get on, and produces firmer fixation) because there are many fractures which are so oblique and so definitely locked in deformity that they cannot be reduced unless you open down upon them, unlock them, and forcibly deliver the bones into the wound; even then they are often hard to reduce and get in apposition. Plaiting here is infinitely the fixation of choice.

Fractures of the Femur. These fractures I believe should be gone down upon and plated, universally, unless it is a transverse fracture, and one is lucky enough to get them in position by ordinary methods of reduction; this is perfectly possible in most fractures of the femur in small children. I fail to recall, in a long array of fractured femur cases in children, that I have had to go down upon them and correct them, and in the vast majority of cases have gotten perfect results by ordinary fixation with splints and extension. The modern surgeon is overlooking the tremendous value of traction in the treatment of fractures. This, of course, is alone of value in the conservative method of treatment of fracture of long bones. The *x*-ray pictures of end-to-end apposition are at times misleading, and even if end-to-end apposition can be gotten by treatment in extension and side splints the weight of the leg is very apt to bring about outward rotation of the leg which produce an altered gait with some limp, even though there be no shortening and the limb be apparently perfectly straight.

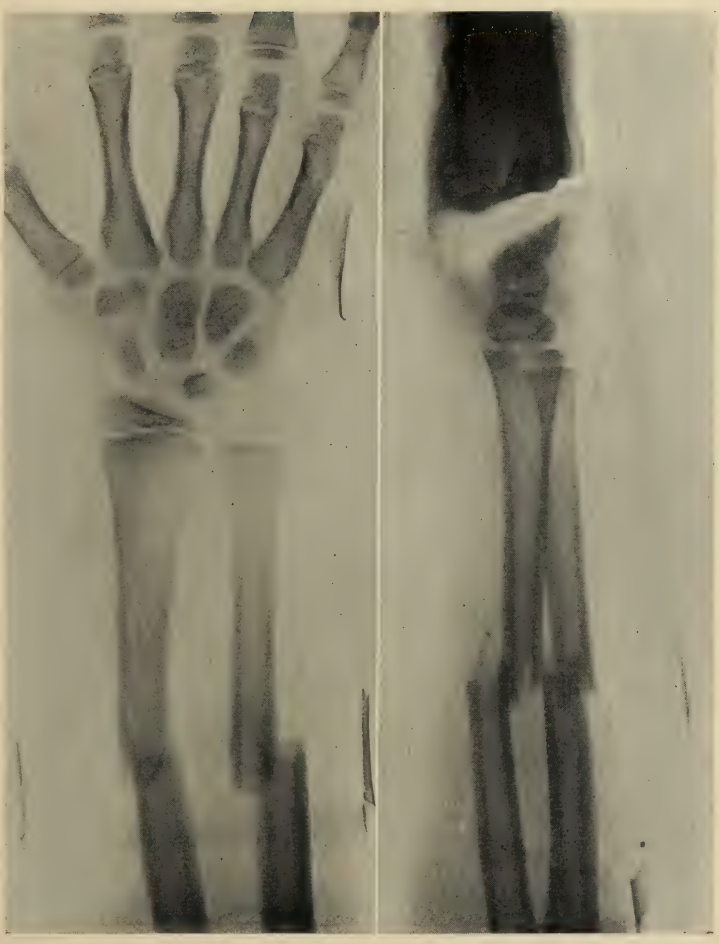
As I said above, the *x*-ray picture is confusing in that it will show an end-to-end apposition and show a straight skeleton at the seat of fracture, but it will not show that there has been rotation of one fragment on the other, and the long axis of the shaft being out of line naturally throws the physiology of the muscles attached out of line, and in

consequence, faulty function is noted. This matter of external rotation outward of the lower fragment is of more importance than a moderate degree of shortening. By the open operation the normal axis of the long bone can be restored and the fragments fixed end-to-end with the long axis of the shaft accurately corrected, and the muscle power of the limb not incommoded, as it is in these cases that have been treated by extension, and although straight limbs have been gotten, rotation has taken place. Furthermore, thigh fracture plated gives a far shorter period of convalescence; the patient is able to be gotten up in a very much shorter period than the one who has been treated with the Gordon-Buck extension and longside splint, and the knee- and ankle-joint are not stiffened by long traction and immobilization and are practically able at once to go on with their functions.

Fracture of the neck of the femur has always been a most doleful picture, always attended with shortening and in almost all cases with non-union, invalidizing the patient for life, if they recover. I believe if the patient's condition warrants it, if the patient is not too old and there are no contra-indications, it should be gone down upon and fracture fixed in position either by plating, or screws or nails driven through from the great trochanter into the neck of the femur; I believe this is the proper procedure whether the line of fracture is intra- or extra-, or combined intra- and extra-capsular.

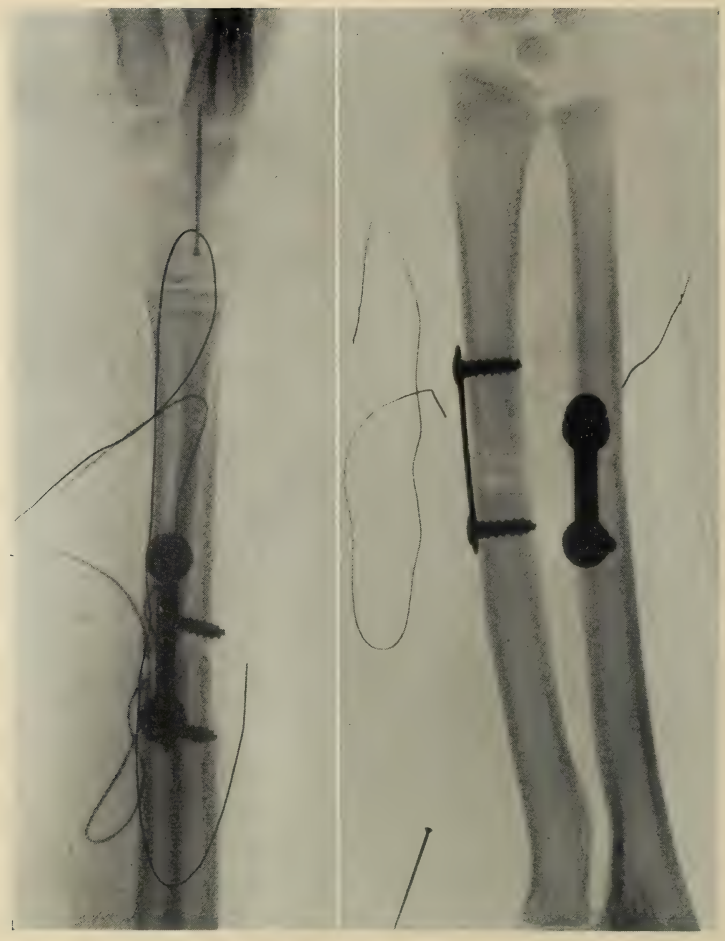
I am convinced that if this plan of procedure is adopted, namely, after earnest efforts are made to get the fracture reduced, and there is failure to accomplish the same, then the open operation is the operation of choice, and definite fixation made at the seat of fracture. By the use of the Lane plate we can accurately fix end-to-end the broken fragments, whether comminuted or not, and give back to that long bone its perfect length and straight position, and one that will hold from the time the plates are put on, and

Fig. 1 (A)



Compound fracture of radius and ulna. (A) shows anteroposterior and lateral view, with displacement and overriding in fracture of both bones of the forearm near middle.

FIG. 1 (B)



(B) shows lateral and anteroposterior views of the bones held in accurate position by plates; plates are seen in picture, and small lines on either side are the subcutaneous silver-wire sutures.

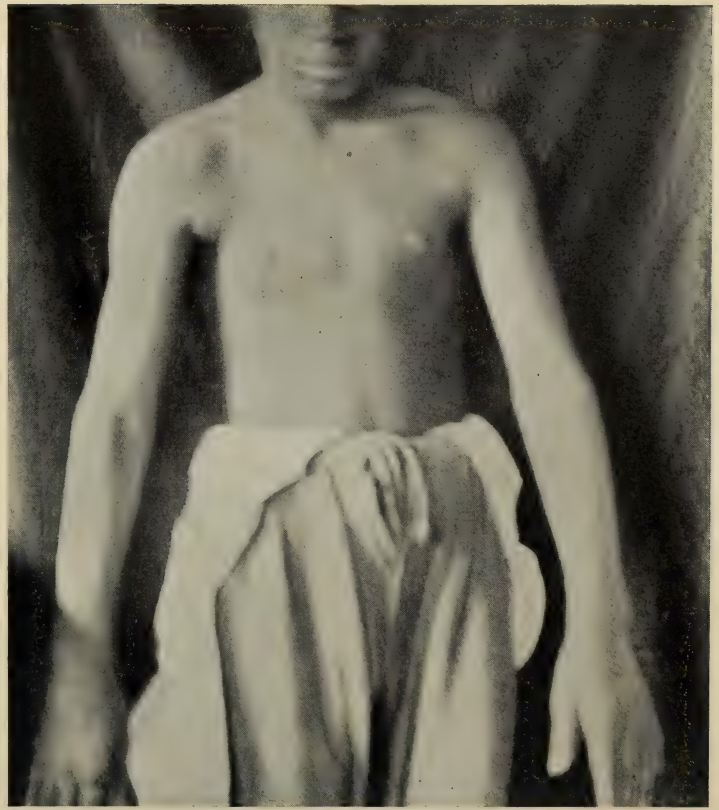
FIG. 1 (C)

(C) Photo of the arm after dressings were removed, showing the perfect straightness and symmetry of the arm. He made an uninterrupted recovery and is still wearing plates.

FIG. 2 (A)

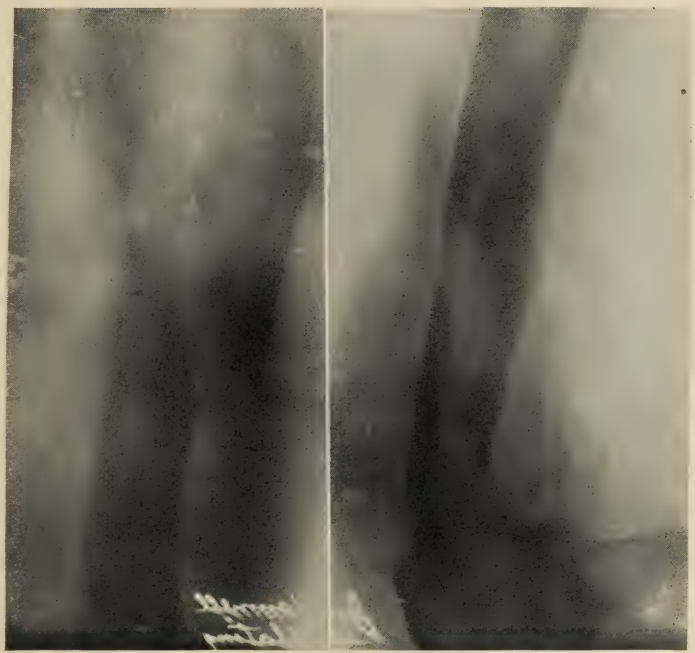
Comminuted fracture of humerus. (A) shows plate and two wire bands put on to hold the comminuted fragments in position and make fixation at lines of fracture. This was successful in making complete fixation, so that the humerus could be moved about without difficulty.

FIG. 2 (B)



(B) Photo of boy's right arm, showing perfectly straight member without shortening and without deformity; excellent functional result.

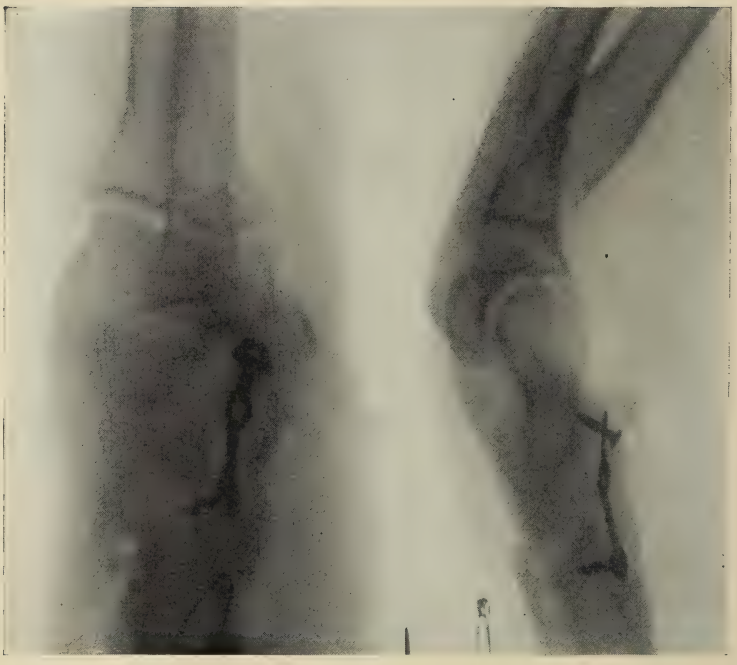
Fig. 3 (A^1) Fig. 3 (B^1)



Compound comminuted fracture of lower end of humerus into elbow-joint. (A^1) shows the anteroposterior view; fracture is obliquely from outside down to internal condyle and into olecranon fossa, and sharp edge of upper fragment perforated skin, protruding some distance, with tremendous destruction of soft parts on inner side of elbow.

(B^1) shows the lateral view and does not show the deformity and extent of injury at all. This shows us very clearly the importance of taking the anteroposterior and lateral views.

FIG. 3 (A^2) FIG. 3 (B^2)

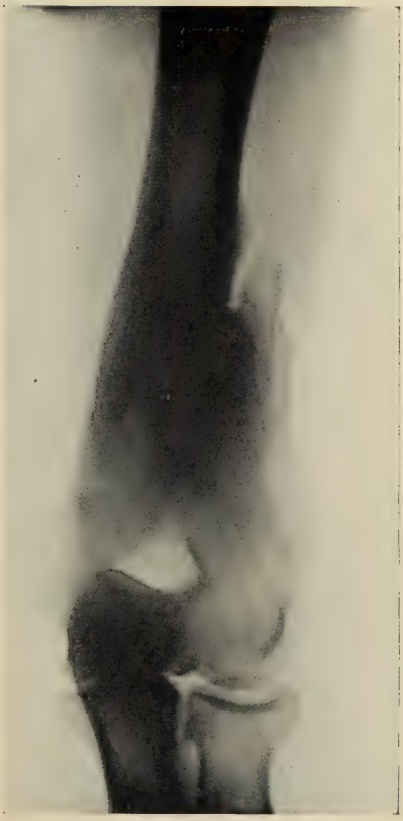


(A^2) shows anteroposterior view with the joint line clearly defined, and plate is seen holding the fragments well together.

(B^2) shows lateral view with the plate immediately over the line of fracture and the fragments in good position. The screw in lower portion of the plate practically extended down into joint line. In this case I found it impossible to maintain any kind of apposition between these fragments without this method of fixation.

Fig. 3 (C)

Fig. 3 (D)



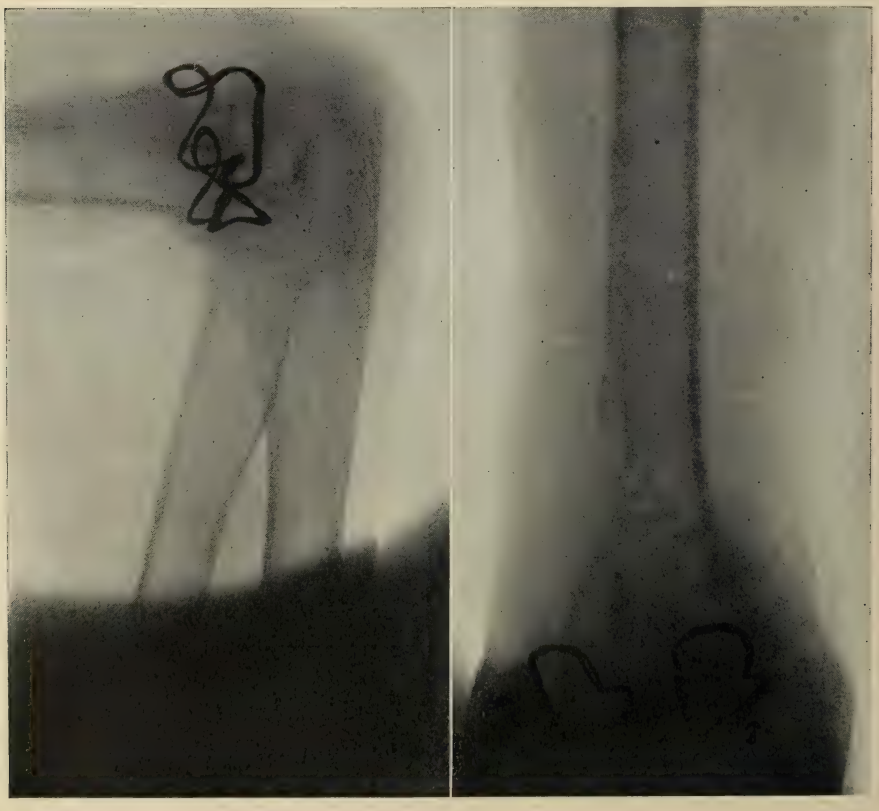
(C) shows postoperative result taken nearly one year after operation; complete restoration of humerus; no interference with elbow whatever, has perfect motion, and humerus at lower end completely and thoroughly restored.

(D) shows anteroposterior view, taken one year after operation; complete restoration of humerus; no interference with elbow whatever, has perfect motion, and humerus at lower end completely and thoroughly restored.

Fig. 3 (E) Fig. 3 (F)

(E) shows arm in perfect flexion with splendid functional result; beautifully developed biceps standing out, and no interference with the joint whatever.
(F) shows the arm in extension.

Fig 4



Compound fracture of lower end of humerus. Picture shows the wires in place and the shaft of humerus brought in apposition with epiphysis. I did not have space in the lower fragment to apply a plate; in fact, it was done before I made use of plates. He had a good functional result.

Fig. 5

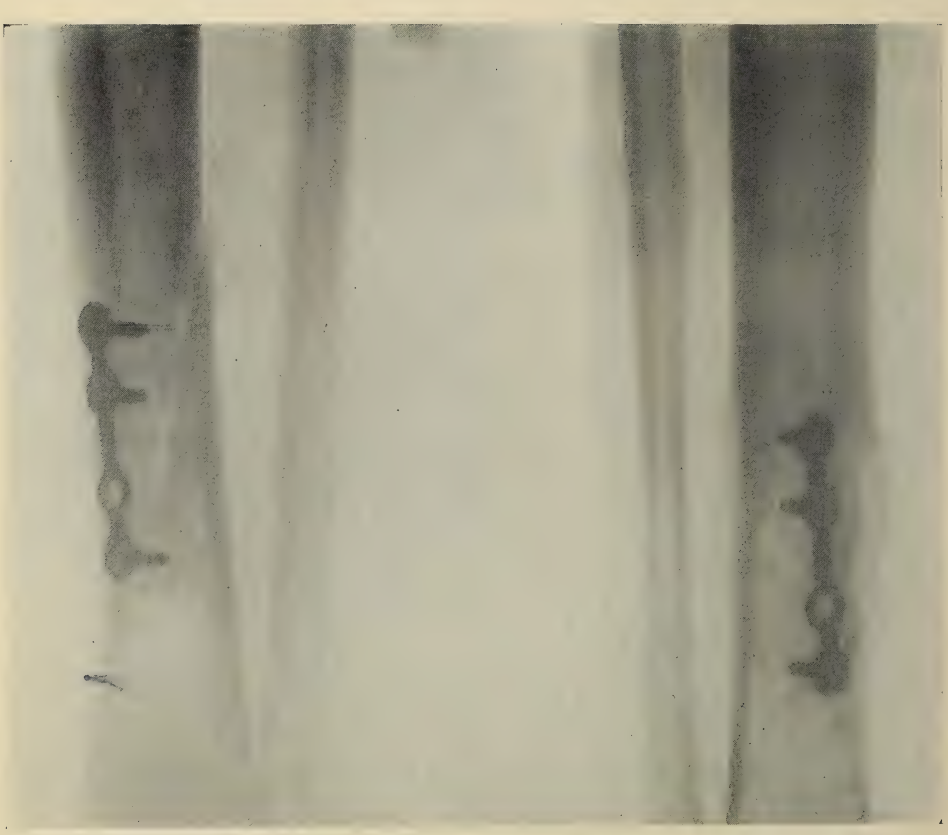
Compound fracture of tibia and fibula. Shows anteroposterior view with plate on and bones in perfect apposition. Had a perfectly straight limb and an uneventful recovery.

Fig. 6 (A)

Fractured tibia and fibula. (A) shows displacement of fragments.

FIG. 6 (B)

FIG. 6 (C)

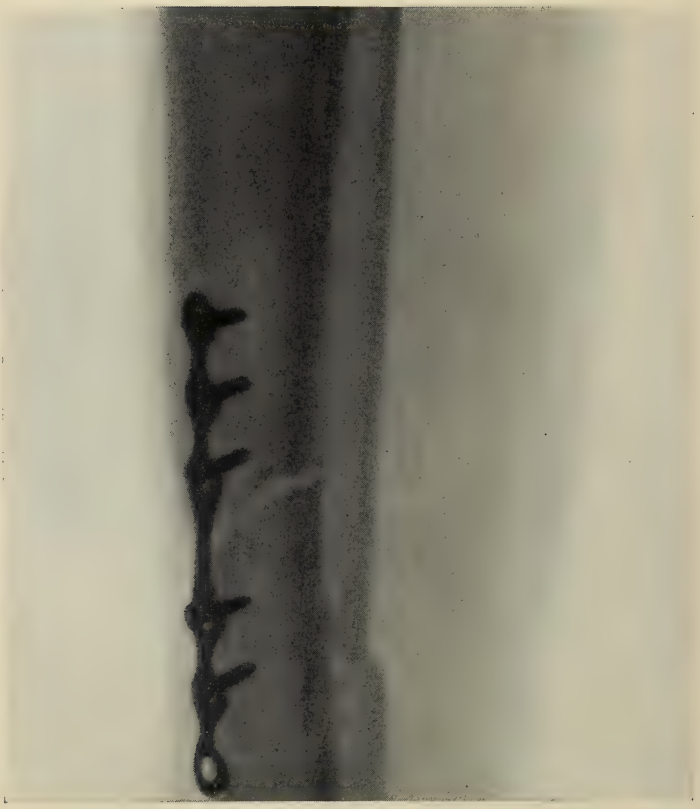


(B) and (C) show fragments end to end as plated.

Fig. 6 (D)

(D) shows photograph of two limbs at expiration of five weeks with perfect symmetry, no shortening, no swelling; had good functional result.

FIG. 7



Compound fracture of tibia and fibula. Lateral view, showing tibia in good position with plate on.

Fig. 8

Fracture of tibia and fibula. Open operation done for fixation of this fracture; bad overriding, in which silver wire was used successfully in maintaining apposition; the picture shows the result at the present time, nine years after operation.

FIG. 9

Fractured patella. Picture shows two wires with fragments in good apposition. My custom is to put in two silver wires, approximating bony surfaces accurately together, rather than to use a plate. Excellent functional result.

Fig. 10 (A)

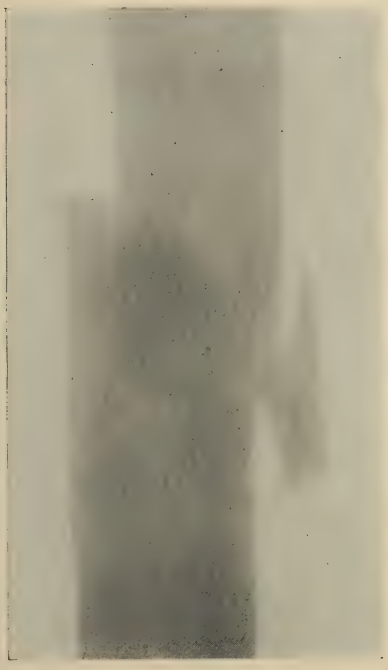


Fig. 10 (B)

Comminuted fracture of femur. (A) shows comminuted fracture of middle of left thigh, with marked displacement and small fragments separated from two larger fragments.

(B) shows lateral view with fragments in apposition and plate on. In order to maintain the loose fragments in position a wire was put all around the circumference of thigh at that point, fastening it to plate.

Fig. 10 (C)

Fig. 10 (D)

(C) shows the wound healed, and gives a lateral view of symmetry of imbs.

(D) shows anteroposterior view, taken seven weeks after operation, with patient erect; no shortening, no swelling. Had an excellent result and perfect symmetry.

Fig. 11 (A)

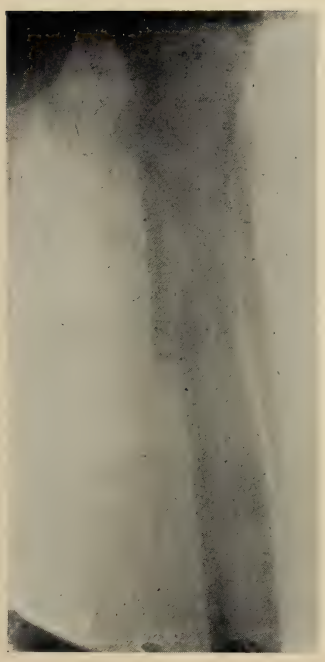
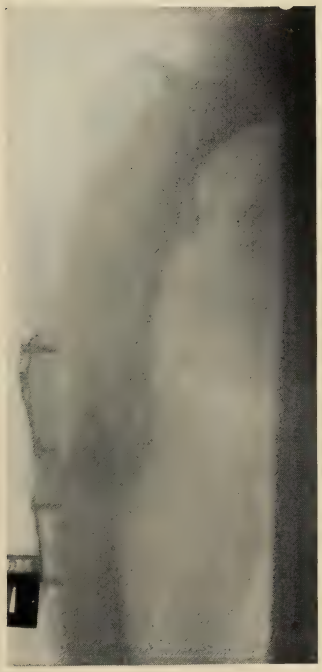


Fig. 11 (B)

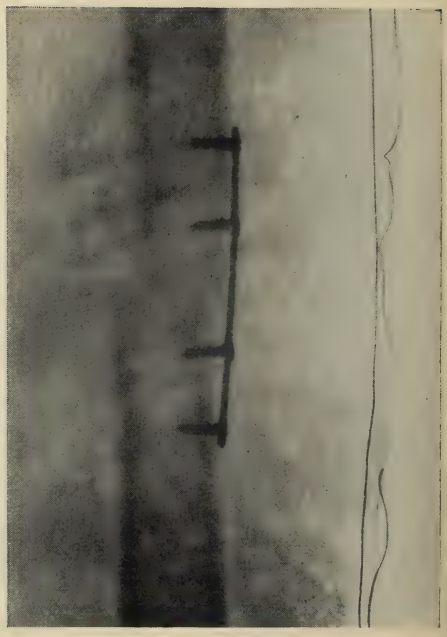


Comminuted fracture of femur. (A) shows comminuted fracture of upper end of left femur, with bad displacement.

(B) shows the fragments in accurate apposition, but on account of comminution two plates had to be used; this brought the fragments accurately end to end and gave good solid fixation.

Fig. 12 (A)

Fig. 12 (B)



Fractured thigh. (A) shows fracture with marked overriding and angular deformity of ten or twelve weeks' duration; three efforts made to get fragments into apposition; certain amount of union had occurred in this faulty position.

(B) After operation of separating fragments and bringing them end to end and plating them; plate is seen holding the fragments end to end. The fine line off to right of picture is the silver-wire subcutaneous suture made use of for closing skin wound. He has complete restoration of length with perfectly straight limb, and has practically recovered from operation (being a recent case.)

Fig. 13 (A)

(A) shows fracture in upper third of thigh; line of fracture very oblique; lower fragment being pulled well upward and inward; upper fragment outward.

Fig. 13 (B)

Fig. 13 (C)

(B) Lateral view of limb following operation, showing cicatrix; as seen in the picture there is no deformity, no shortening, but perfect symmetry between two limbs.

(C) shows anteroposterior view with two limbs side by side without any evidence of any deformity whatever; limbs both the same length, with perfect symmetry and a good functional result.

Fig. 14 (A)

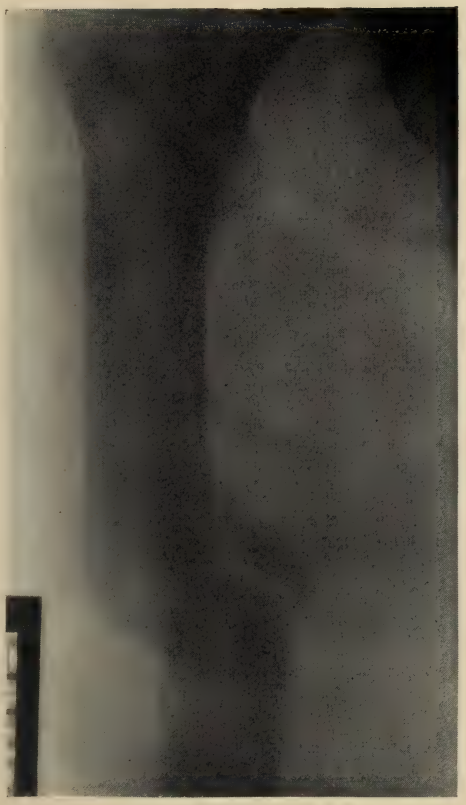
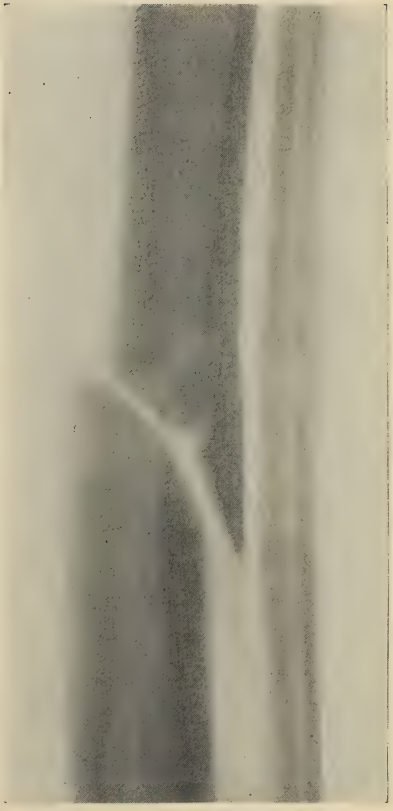


Fig. 14 (B)



(A) shows fracture in middle of left thigh with marked overriding and deformity. Compound fracture of tibia and fibula. (B) Compound fracture of tibia and fibula with slight displacement.

Fig. 14 (C)

(C) Picture, taken eight months following adjustment of fractured tibia and fibula, shows bones united and callus at seat of fracture; the man was badly shocked when he came in, and I was able to adjust the bones satisfactorily, so did not go down upon them.

Fig. 14 (D)

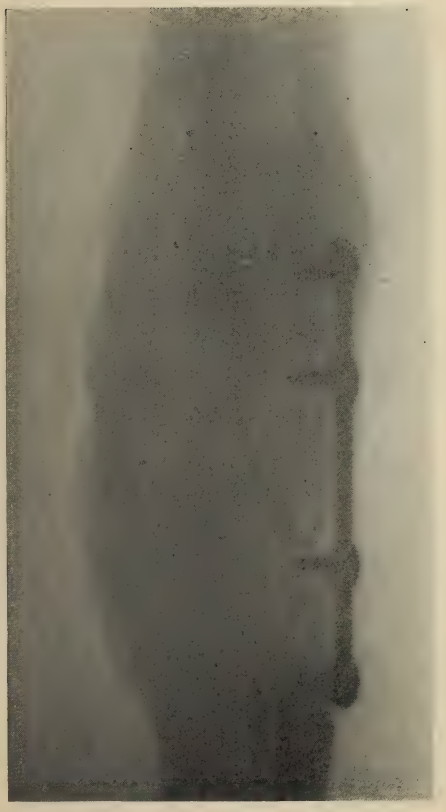


Fig. 14 (E)

(D) Picture taken eight months after the thigh was operated upon and plated; plate is seen in picture, and a large amount of callus is noted at seat of fracture.

(E) Photograph eight months following the injury, showing man with perfectly good leg, without shortening and without deformity; he was up and about on this limb two weeks after thigh was plated.

Fig. 15 (A)

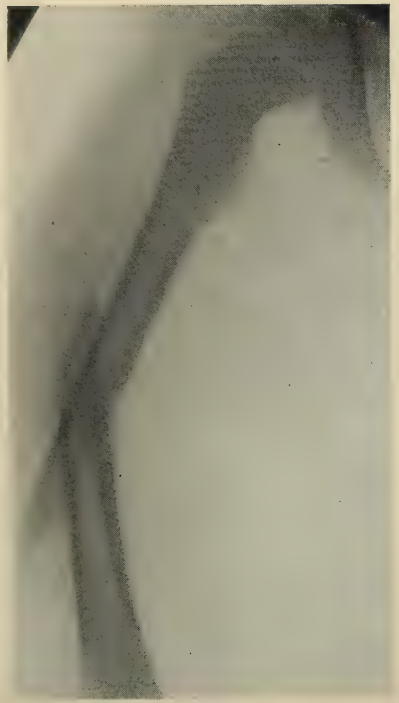


Fig. 15 (B)

Oblique fracture of thigh. (A) shows oblique fracture of thigh in middle.

(B) After patient was anesthetized, splints and extension applied; I considered the position sufficiently good not to go down upon it; excellent result; no shortening.

Fig. 16 (A)

Fig. 16 (B)

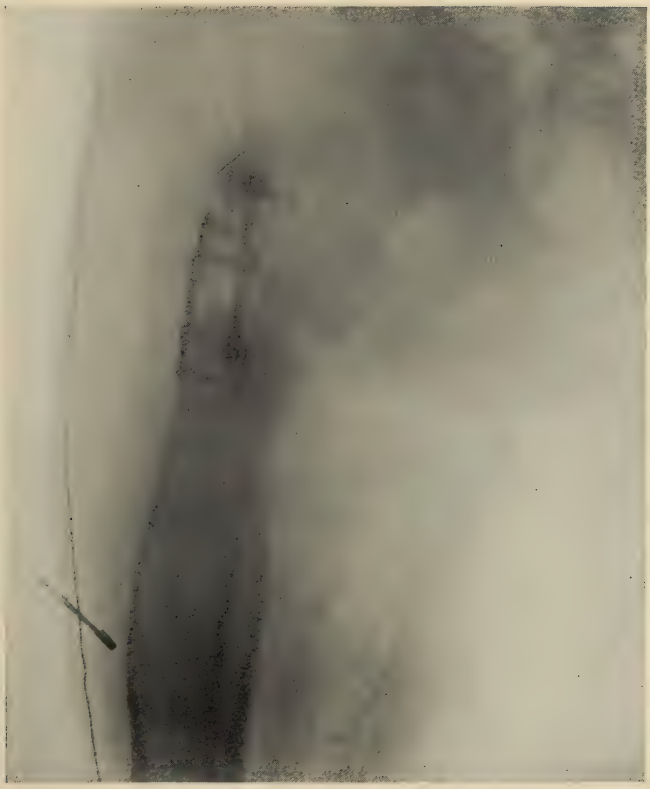
Subtrochanteric fracture. (A) shows marked displacement of fragments, with upper fragment tilting well out; lower fragment strongly pulled upward and inward and found adherent to neck of femur. There was definite union in this faulty position, and at operation it had to be chiselled away; on account of this overriding there was at least two inches of shortening.

(B) shows the seat of fracture after the deformity was overcome and bones brought end to end; plate seen in the picture as applied at operation. Patient made good recovery; had good union, and plate is still intact, not having given any trouble. Good functional result.

FIG. 17 (A)

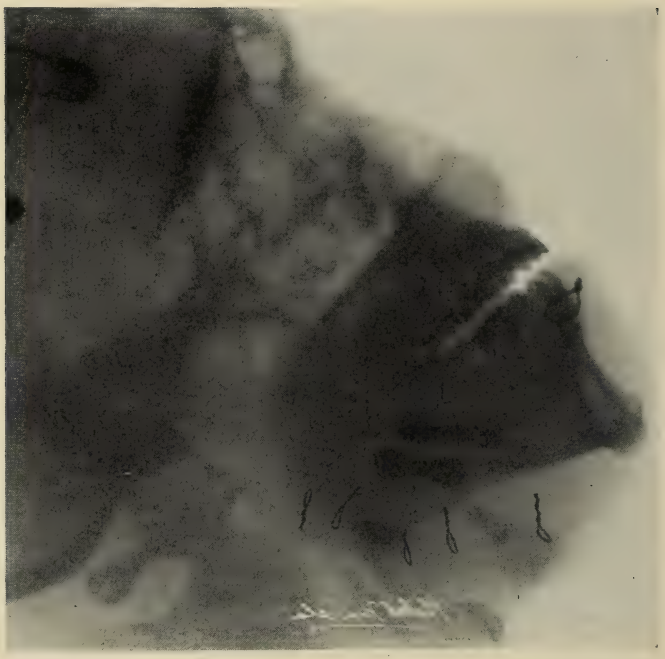
Subtrochanteric fracture. (A) shows fracture through upper portion of the femur, practically running from greater through to lesser trochanter; line of fracture extending generally into neck of femur, and it has the appearance of being a refracture at this point; almost a right-angle deformity here, with limb strongly adducted and utterly powerless to carry out any of its functions; marked shortening, possibly due to old fracture of shaft, which is seen in plate lower down. This occurred some years ago.

Fig. 17 (B)



(B) shows fragments in position and plated with two plates and limb put in strong abduction and flexed. After plates were adjusted the limb in its entirety could be rotated freely at the hip, showing that the hip-joint was not ankylosed, and full, free rotation, flexion, and extension could be made after plates were put on.

FIG. 18



Multiple fractures of inferior maxilla. He had multiple fractures of the inferior maxilla with marked deformity; one line of fracture was back near angle of jaw, where there was marked separation of fragments, and the other was in midline near symphysis. Picture shows two plates over seat of fracture, back near body of jaw, holding fragments in accurate apposition, and silver wire put around adjacent teeth, fixing line of fracture in midline. After the plates were installed and wires put on the mouth could open and shut without difficulty and without motion at seat of fracture.

Fig. 19 (A)

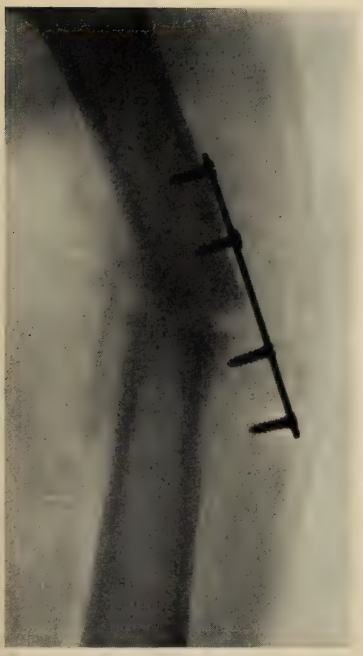
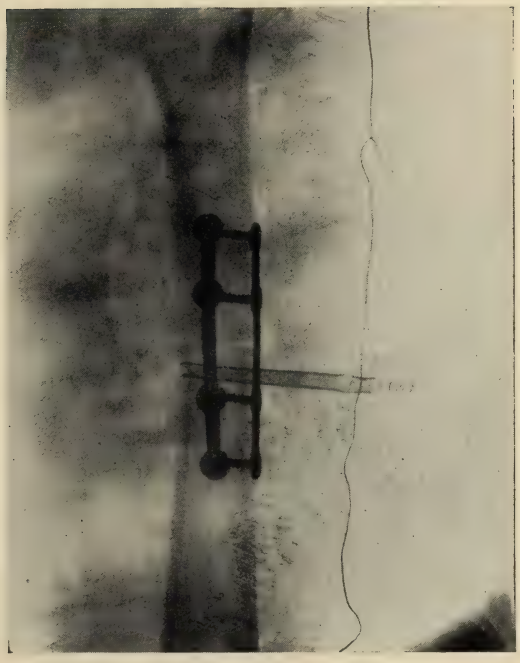


Fig. 19 (B)



Fractured thigh. (A) shows plate pulled off from lower fragment and angular deformity at seat of plating. This shows what may happen in these plate cases occasionally. Just why these screws pulled out and the deformity was produced, it is difficult to understand, except that the bone in this case was rather soft and the screws did not get a good hold in the shaft of the femur. There has been no effort at bone regeneration on the part of the patient in this case.

(B) shows two plates on and good bone apposition. In the picture at (*a*) is seen the drainage tube, which was put down to the seat of fixation. The long mark is a subcutaneous silver-wire suture which was used to close the skin wound.

the limb can be rotated as if it had been thoroughly repaired by callus. I have shown this on almost all of the thigh fractures I have plated. As soon as the plate is screwed tightly on the bone and there is complete fixation the bone can be moved about fearlessly. I believe, as Lane does, that a man has to have certain mechanical knowledge in order to accomplish these results properly. The man who is not handicraftsman or carpenter enough to mend the leg of a chair is not surgeon enough to mend a broken bone of the human body, certainly not by the open operation, and certainly he should not be allowed to do the open operation for the correction of a broken bit of skeleton anywhere. It is distinctly a major surgical operation, and should be undertaken only by those who are careful operators with good technique, and who are accomplished handicraftsmen. There is no surgical operation that requires more thorough and complete and careful knowledge of an aseptic technique.

Complications. If the operating surgeon observes the ordinary precautions there should be no serious complications following. I have seen most shocking and brutal results, however, following the open operation method of treatment of fracture in the hands of inexperienced men. Only recently I saw a child not only lose its arm but its life; a little tot of four years of age who broke one bone of the forearm, a simple fracture, and was cut down upon and wired. A rapid emphysematous gangrene occurred from filthy surgery, and I was asked to see it in consultation when this emphysematous gangrene extended up to the shoulder; the arm was taken off near the shoulder, but the child died from the combined effects of that and the rapidly spreading gangrene. It was totally unwarranted; a death due to meddlesome surgery; because in this particular case there was no reason why this fracture should have been gone down upon, nor is it, in my judgment ever, warranted in the very young.

The Operation. In ordinary simple fractures the seat of fracture is gone down upon, the periosteum is stripped back from the bones, which are delivered with Lane forceps (which I find the most excellent forceps for delivering bones and bringing them in position), the plate is applied, and the wound closed without drainage. I believe, as Lane believes, that careful covering of the skin, protecting the wound from any contact with things that have rubbed over the skin, is a very important step and should be observed, namely, sterile towels should be clamped around the skin edge after the skin wound has been made, and skin immediately adjacent should be covered absolutely through the remaining steps of the operation. In compound fractures where there is already infection at time operation is begun, I believe plating should be resorted to, and after callus formation has begun and there is evidence from sinuses or what-not that the plate is acting as a foreign body it should be taken off; as a rule, a plate applied in compound fractures needs to be removed. For the chief object sought after is to get the bones end-to-end and hold them there while bone regeneration takes place, and this can only be done by some fixation device. Plates that are put on the tibia immediately under the skin with but little covering often have to be removed; usually I have found in a long list of cases where I have, prior to my using plates, used wire, that the wire when covered well was buried and never acted as a foreign body or gave trouble either in patella fractures, where I always use it and use it today for bringing fragments in accurate approximation and maintaining them there, I have never had to take it away. I am convinced that this is the best means of fixing broken patellas; I have never resorted to any other fixation device. I have several illustrations contained in this picture list showing the wires in place.

This same procedure I think well of, and always use, in fractures of the olecranon and prefer it to other methods of

fixation. So, likewise, I have found since I have been using the Lane plate that when I can carry out my operation in a careful manner and cover the plate well I have not yet had to remove one. In superficial places, as over the crest of the tibia, I usually take it away, especially if it is a compound fracture, before the patient leaves the hospital, so that he will not be invalidized later by coming in to have a second operation done for removal of it.

Fractured Clavicle. I believe the time may come when all broken collar bones that cannot be held in position will be gone down upon and some method of fixation made use of; that is, if there is marked overriding that cannot be controlled; this need should be exceptionally rare, but an occasional case may have to be treated by its use.

The only short bones that I have used the plating upon was in a recent case of fracture of the inferior maxilla where the fragments could not be gotten in position, where there were multiple fractures, one near angle, one at symphysis. I opened down and got the fracture in good position, and held it by a Lane plate with excellent results. It may be necessary to use smaller plates and screws than the ordinary bone plate. There is no excuse for bad overriding in fractured clavicle, or ugly deformity, because the clavicle can be easily gone down upon and accurate approximation of fragments easily made, so that repair will go on and not be followed by ugly deformity which is so commonly the case in all fractures treated by splint application.

Should we rely upon the fixation device alone, plating, wiring, or what-not, for maintaining accurate approximation while callus is being formed for repair of fractures?

This is a question I am not prepared to answer. Personally, I do not rely on the fixation alone, unaided by other external splints. I have not as yet had the courage to do that, but I presume that some men do. Lane, apparently, relies on the fixation device alone; whether it is a rule he adopts throughout I do not know, but with the case of a

thigh I saw him plate in Chicago recently he did not put on any external splints, only dressings to the wound. His idea for not doing it was exceptionally good, and the principal one that he expressed was that he did not wish to immobilize the knee-joint, but wanted it to be free so that motion could be kep tup and thereby prevent the stiffening from the long immobilization due to splints which handicapped the full usefulness of the limb for so long a time.

The bones seem so solid after the plate is on that one feels warranted in not applying an external splint, but I have as yet not adopted the plan. I have incorporated in this article a selection of cases that cover as near as possible the entire skeleton. Of course the principal ones have to deal with the long bones, but there are some few short bones, namely, the phalanges and jaw, which are shown.

Conclusions. There are four chief indications for the open operation, and I think they practically cover the entire list:

1. If after repeated attempts, if necessary, the bones cannot be placed in apposition or cannot be maintained in apposition, the open operation should be resorted to.

2. If, after reduction of fractures of long bones, no crepitus can be elicited, you should be suspicious of interposed soft parts and resort to operation in order to prevent a delayed or non-union which produces an unnecessarily long period of convalescence.

3. All open fractures, as a rule, should be cleansed, fixed, and if necessary drained.

4. All cases of delayed or non-union and all cases of vicious union should be subjected to immediate operation; no efforts at reduction without operation should be employed.

DISCUSSION ON THE PAPERS OF DRS. FREIBERG, HENDON, MOORE, AND MARTIN.

Dr. C. E. Caldwell, of Cincinnati, Ohio.—There has been so much literature on this subject and so much said regarding it that perhaps it is a supererogation to say anything at all. The only thing I would like to say is that in the number of cases of fractures that come before us in the hospital, it is only in comparatively few of them that we fell it necessary to operate upon by the open method. I am convinced that even with the best asepsis the majority of us have had at some time or other a certain proportion of plates to remove. That is no special objection because the removal of a plate after all is a slight procedure and does not involve harmfulness to the patient; yet at the same time, I am convinced that if we can bring these fractures into any degree of apposition without the introduction of a foreign body, the patient is so much the better off. I have found it possible in a number of cases to do this.

In a resected fracture dislocation occurring in a motor cyclist, a policeman, who came into the hospital, the *x*-ray showed a fracture dislocation at the neck of the humerus, and the head of the humerus was completely turned around so that the articular surface was turned outward. I put the man under an anesthetic and attempted by manipulation to restore the head but failed. I felt convinced it could not be done. I made an open incision, restored the head, and simply sutured the torn periosteum with sterile catgut, and put the arm in plaster with a cap over it and obtained a most excellent result with it, with no foreign body in the wound. Frequently also in fractures that cannot be reduced apparently by traction or in that way, complete traction of the limb, bringing the fragments together, throwing them out and overflexing the limb, but turning it, the *x*-ray will show a fair enough apposition for a functional result. In open fractures, after having once reduced the fracture, it is unnecessary at times to introduce any kind of holding plate. Having the fracture reduced more or less end-to-end suture of the periosteum and a fixation splint will hold it, because after you have reduced the ends of the bone, there is no more muscular pull. As we go along we gradually make modifications and we will not resort as frequently perhaps to the procedure which the distinguished

author so highly recommends. It is not a thing to be generally recommended even with the best of asepsis, and it is a source of discomfort to have to remove plates in cases apparently that present very few difficulties.

Dr. E. Denegre Martin, of New Orleans, Louisiana.—I am heartily in favor of the methods advocated by Dr. Martin. I think I could easily show a hundred slides of the open method of treatment of fractures, as I have been doing this work for eighteen years. My rule at the present time is that when a fracture cannot be reduced and held in position, I do not hesitate to cut down upon it, hold the fragments in place by means of plates or with such fixation as I think best. I believe my results are better for so doing. I have no hesitation in saying that every one here today, as he perfects his technique, will resort more and more to the open treatment of fractures.

I want to show you a method we have been using in New Orleans for oblique fractures and for suture of the patella. When Dr. Milne, of London, England, came over to this country and spoke before this Association he suggested a band for the treatment of oblique fractures. Working upon this suggestion, Dr. Parham and I devised a band which is much simpler in construction. Very often in an oblique fracture one end is thin and if an attempt is made to introduce a screw the bone will break. Application of the band is simple. It is made of malleable iron, one-quarter of an inch in width, and six inches or more in length, with an eye in one end and a slot in the other. It is applied by bending it sufficiently to pass around the bone, then the small end is threaded through the slot and attached to an instrument for tightening it. In two cases there were perfect results by the use of this method. One was a case of oblique fracture of the tibia. By putting the band around in this way contraction of the muscle makes the band tighter and tighter, because of the tendency to override. The other was a fracture of the humerus higher up. In the first case the result was beautiful. Unfortunately the gentleman sustained a crushing accident of the leg and lost the entire tibia. The night after the accident he got up and walked around the ward without any external splint.

We have used these bands in three cases and I hope at another meeting we will be able to report several additional cases. They are so easily and quickly applied and perfect in results that I am sure any of you will be satisfied with their use.

A criticism was made sometime ago that in encircling the bone it might interfere with circulation. That is not so. I have absolute proof of that, and if there is necrosis it is because of injury to the circulation at the time of accident.

I have treated six cases of fracture of the patella in the following manner: I simply run a wire through the tendon above the ligament below crossing over the fragments, and as the wire is pulled upon it tightens the fragments and holds them together. It will not break. If strong annealed wire is put in and properly handled you need no splint. The skin is incised through a transverse incision. The fragments are held with a vulsellum while placing the wire, and in two weeks the patients are allowed to get about. In the beginning I flexed these cases fearing there would be ankylosis. When you have ankylosis of the knee-joint with the leg flexed there is less danger of breaking the union in the patella. Put the leg up at an angle of 15 degrees, begin by breaking up union by straightening the leg which keeps the tension off the patella and obviates the danger of tearing loose the new-formed tissue in the patella. I began this treatment twelve years ago, and patients have never had a moment's trouble; it does not require splints and there is no ankylosis.

Dr. Randolph Winslow, of Baltimore, Maryland.—I have listened to these papers with interest and especially to the one by Dr. Moore in regard to fractures of the neck of the femur. As was shown by Dr. Martin, one of my cases had screws in the neck of the femur. Until a few years ago, I in conjunction with nearly everybody else, treated fractures of the neck of the femur by means of splints and extension. The results were not good. Two or three years ago we began using screws and nails in the neck of the femur and particularly in intracapsular fractures, where the fracture is behind the head of the femur where it joins the neck. While I have not had bad results in these cases, it seems to me it is too serious an operation to make a practice of, and certainly it is an operation that I am not justified in recommending my pupils to undertake. I am justified in recommending to my pupils the method Dr. Moore has presented here, and I shall be very glad to recommend it to them. In the last year I have been recommending the Whitman method, which is flexion and abduction and the application of a plaster cast, but I shall have no hesitancy in recommending the method presented by Dr. Moore. While

the two methods are on the same principle they are somewhat different. I think the operation of passing screws from the trochanter into the head of the femur is a serious operation, and should not be undertaken except as a last resort in the hands of an expert.

One case that came under my observation and care was that of a man who had been under the care of a physician for seven weeks who was treating him for rheumatism. The *x*-ray showed a fracture of the neck of the femur. I passed screws into the head of the femur from the trochanter, with a result of getting bony union.

In regard to the subject in general I think we have got to be very conservative in the matter of the open treatment of fractures. It would do for Dr. Moore and for Dr. Martin; it would do for perhaps most of the members of this Association, but it is not a method to be recommended to the country doctor and to the general physician. There are certain fractures that can only be treated satisfactorily in this manner, and there are many fractures that can be treated satisfactorily in other ways. My friend and colleague, Dr. Martin, recommends plating fractures of the clavicle. I hardly think it is necessary to plate a fracture of the clavicle. It heals fully as well without it; and the cases in which we would be most pleased to secure union without deformity are those occurring in young women, and in them any scar would be more objectionable than the little lump that might be left. I think we have to be cautious and conservative in our statements before an Association like this, whose proceedings are widely circulated, because a very large proportion of cases of fracture will do perfectly well without the open treatment. On the other hand, very many of them will not. Spiral fractures, oblique fractures, fractures of the upper end and lower end of the femur, fractures of the patella, fractures of the olecranon, and many fractures involving joints we know perfectly well when we see them, and see the skiagram, can only be treated properly in that way. But there are many other cases that do not require the open treatment.

Dr. J. Garland Sherrill, of Louisville, Kentucky.—I might mention a wrinkle that I used in one case. If you will cut the tendon, pulling the clavicle out of position by a subcutaneous tenotomy you have no trouble in obtaining reduction and avoid the necessity for external wounds and the use

of a plate. If you employ a catgut suture to sew the quadriceps which is torn, you will not sew the patella together with wire, and you will get a much better functional result.

There are some cases which need open treatment for their cure, but that the number is large I do not believe. If we can obtain healing of a fracture without leaving any foreign substance in the limb and can get a good functional result, I believe that method should be adopted in preference to one which exposes the patient to the danger of infection and infection may occur in the most competent hands and be likely to occur outside of a well-equipped hospital. In the first place it is work that should be done by a master in a well-equipped hospital.

Dr. Joseph Ransohoff, of Cincinnati, Ohio.—I have operated on fractures since 1891. The Lane plate is only a modification of what Schede first used, ivory plates with screws. They were made of vanadium steel and the sheet plates made of ivory. The operation is not a new one. In 1891, I reported 8 or 10 cases to the American Surgical Association of bone plating with the ivory plate. There can be no question that this practice is being overdone, and one of the detriments in advising operation in most cases of subcutaneous fractures is that we neglect the study of treating fractures without the aid of operation, and I think students ought to be taught how in the great majority of cases one should treat these fractures without operation. The operation when done on the thigh, for instance, of a large muscular man, is exceedingly grave. No one can question that, and in the hands of the most expert the operation will sometimes necessitate working for an hour or an hour and a half as Lane did in some of his cases. Think of a young practitioner getting a thigh to operate upon without any experience. Just think of what may happen. We should teach these young men to treat these cases without operation. Many fractures occur in which it is impossible to move the patient to a hospital where all the facilities for operation are at hand. I have in half a dozen cases of fractures of the femur overcome shortening and the lateral axial rotation by a simple procedure, the use of the ice tong. It has not perhaps attained the recognition it merits, but I am going to tell you how you can make extension by means of the ice tong. It is a modification of the nail extension that has been so extensively used by Codivilla, of Italy. By taking the ordinary ice tong, by driving under cocain the points of the tong not more than one-fourth

of an inch into the femoral condyles, the mere traction of the lengthy prongs of the tong causes them to be more deeply inserted, and with the leg upon a double inclined plane traction can be efficiently made and an enormous advantage is derived therefrom. With this traction by the ice tong there is no interference with the motion of the knee while the patient is under treatment.

I would like Dr. Martin to tell us about the end results in fractures about the lower end of the humerus. In fractures of the thigh and humerus, when we come to fractures of the lower end of the humerus I want him to tell us how he holds these fragments in place when he has not got them under his fingers. We see cases of fracture of the lower end of the humerus in which the fracture is not a simple one but it resembles a mass of crushed bones within a bag. A plate will not hold them and you cannot get wire to hold them in place. What justification is there in cases of that kind for adding injury to injury?

In well-regulated hospitals *x*-ray pictures of fractures are usually taken in a routine way, while in others an *x*-ray is not taken until a bad result necessitates its being taken. I believe that obtains in most hospitals in which cases are neglected and we are inclined to hold the general practitioner to account and say it is his fault. We say he is legally responsible for he does not insist upon an *x*-ray being taken, yet in a first-class institution we find an *x*-ray is not taken in the beginning of a fracture but is taken when the result is bad.

I would like to call attention to one other point, and that is, the importance of the *x*-ray and of watching these cases afterward. I have seen one case in my hospital in which there was a crushing injury of the upper end of the tibia. If we represent the upper end of the tibia here like that (indicating), with the spinous processes like this (illustrating), just on one side or the other there is a crushing injury directly upon the foot and there is a little infraction scarcely noticeable. There is no displacement at all. We have a fracture of more than an inch below the articular surface extending into the joint itself, a fracture that is not recognized except by the *x*-ray, and we were enabled to make a diagnosis by the point of tenderness. If that fracture does not heal, an unusual thing occurs, after a short time we have a knock-knee or a bow-leg developed. After a patient with a sprain of the knee is ready to walk he will

notice after two or three weeks walking he develops knock-knee or bow-leg and the result of pressure of the femoral condyles on this fragment, which is pushing out or in, would necessarily result in deformity which is hard to understand unless one has studied these cases by means of the *x*-ray, and here "an ounce of prevention is worth two pounds of cure." If we recognize these as fractures they do not develop knock-knee or bow-leg.

Dr. Alexius McGlannan, of Baltimore, Maryland.—I rise to call attention to an absorbable plate which was described last summer in the *Journal of the American Medical Association.* This plate is made of animal bone and the fracture is fixed by means of pegs made of the same material. We were led to consider the manufacture of such a plate because of the number of Lane and other metal plates we were compelled to take out of our own fractures, as well as those of others, but not so much our own fractures as fractures operated on by other surgeons. When we considered that most of them came to us from other surgeons we were led to think that some of our cases were going to other men to have their plates removed. That prompted us to look into the matter of an absorbable plate. This plate has worked well in the only case in which I have used it. Since I had this plate made the number of cases upon which I could operate has become fewer and fewer. The number of such fractures has diminished rather than increased. At the same time I described what I called an intermedullary splint. I have had one opportunity to use this splint. It is a bone nail that is boiled and sawed to fit, and driven into the medullary canal of the fracture to hold the ends of the bone. This bone nail has served us very well in fixation of an old comminuted fracture of the neck of the femur.

There came into the hospital some three months after injury a case of fracture of the hip in a middle-aged adult, about six feet tall, weight two hundred pounds, who gave a history of having fallen off a hay wagon. He was sent to Baltimore and a diagnosis of fracture of the hip was made by the *x*-ray. He came to us and it was clearly a case of traumatic coxa vara; *x*-ray showed a comminuted fracture at the hip, and we fixed the trochanter to the base of the neck and into the head of the bone by drilling a cavity and driving one of these nails in the full length, sawing it off short with the tip of the trochanter. That fixed the bone firmly and the patient recovered with a good leg.

Ordinarily we do not operate on fractures of the neck of the femur. We have had over thirty cases since 1905, and I recall one recent fracture of the neck of the femur in a fat woman in whom no other form of fixation would help. We have treated our patients except the last one by the Whitman plaster-of-Paris cast. We felt that to put a patient firmly up in plaster who was so extremely fat, in poor general condition, after putting her under an anesthetic, would be dangerous. We put the patient to bed, treated the fracture by making traction with the knee flexed so that the thigh could be abducted and carried in inward rotation by pulley. That patient has been up three weeks and stood this fixation in bed very well.

Dr. V. P. Blair, of St. Louis, Missouri.—I am not an advocate of indiscriminate plating of fractures, but I think Dr. Martin shows very clearly what can be done in some cases in the treatment of fractures without plating. I think there is danger of exploiting and substituting plates in the treatment of fractures for the simple use of splints.

A remark was made regarding the use of the *x*-ray as an aid to the diagnosis of fractures. It seems to me it is almost impossible to get interns away from the idea that the *x*-ray is the only thing to diagnose their fractures and that they cease to make an old-fashioned examination of fractures. They want to rush the case down to the *x*-ray room. They know nothing else.

I would take exception to the remark in general about the use of plates in fractures of the jaw bones. There are extremely few fractures of the jaw bone where there are any teeth in which you cannot get perfect results by wiring the lower to the upper teeth.

With reference to nonunion, we know that in a number of cases tissue is found between the ends of the bone. The fact that in so many cases in which we cut down and find tissue between the ends of the bone is sufficient argument to show that it is one of the causes of nonunion; but there is one cause of nonunion which we have long suspected and of late I have been able to demonstrate it in a number of cases and that is syphilis. Since we have had the Wassermann to check up we have found in the majority of cases of nonunion that came to us for operation the patients have had positive Wassermanns. Further than that, going back to a lot of cases that have been plated and have not united those were later found to have

positive Wassermanns, and those patients got well when the syphilis was treated.

Dr. George A. Hendon, of Louisville, Kentucky (closing the discussion on his part).—I do not think anybody can deny the fact that the open treatment of fractures is an institution that cannot be ignored. The sole object of my paper was to endeavor to point out the conditions in which it was applicable, in which it was preferable, to the older methods of treatment. I have demonstrated in my report of cases by two bad results that arose from my unfortunate selection how important it is to use proper discrimination. Both of these patients suffered amputation of the leg because they were not the proper kind of cases in which to use the method. One was a case of compound fracture in which the wound had not healed completely. The other case was a comminuted fracture and I endeavored to plate a large fragment in position. This fracture involved the tibia, fibula, and in consequence of improper selection this man also lost his leg.

As I have previously said, the object of my paper was to endeavor to point out those cases in which we can use the open method with the best results. There are conditions in which it is superior to the older method of treatment. The latter are not satisfactory; otherwise there would not be an undercurrent of unrest with reference to the treatment of fractures. I want to accentuate the point that it is our duty to properly select our cases.

Dr. James E. Moore, of Minneapolis, Minnesota (closing the discussion on his part).—I have been teaching surgery for over twenty-five years. One of the principles that I have tried to instill in the minds of students from the first day I met them is that operation is not the whole of surgery. Any good mechanic can perform an operation, but it takes a surgeon to know when to operate and when not to operate. The trend of the discussion today shows the trend of surgical thought. It demonstrates the reasons why this is a splendid method of treatment for fractures of the neck of the femur, and what I have tried to advocate today has been very much neglected. Surgeons, whether teachers or not, are disposed to think operations are the whole of surgery. They do not want something they can treat otherwise. They want something to perform an operation upon. That leads to open dissension on the part of the laity who say that we are looking for an operation fee,

and that is sometimes true. I like to operate as well as anyone, but I like to be sure the operation is indicated and that it is the best thing to do for that patient.

Dr. Martin suggested that the future treatment of fracture of the clavicle would be done by bone plating. I do not believe it. I tried it, and it does not work. The clavicle is a crooked, uneven bone. You can get a short splint on there and this screwed on either end will not fix the fragment. I have tried it and I have removed the plate. The patient had complained of it and that is true of most fractures where a plate is near the surface.

I am interested in the advocacy of the application of plates in compound fractures. It is the consensus of opinion among surgeons that in compound fractures a plate is contraindicated, and if one can apply it successfully this is an argument the other way.

Dr. Ransohoff emphasized an item which I think is of very great importance, namely, that medical students should be taught how to use splints in the treatment of fractures. They should be taught other methods of treating fractures which should come first, just as one of the speakers suggested that the ordinary methods of diagnosis should be used before we resort to the laboratory. Another principle I would lay down and teach to students is that laboratory examinations are only supplementary, and that clinical methods of diagnosis must be the foundation.

I have been greatly interested in Dr. Winslow's discussion. He shows how broad-minded the surgeon should be. He demonstrates that he has not been satisfied with the treatment of fractures of the neck of the femur by the old methods. He has been treating these fractures of late by means of operation and has obtained good results, but he says candidly he believes it is too much operation for the case, and I agree with him most heartily.

Dr. Martin (closing the discussion).—When I started my paper I said that I had not been an advocate of the open operation in *all* fractures. I have not been an enthusiastic believer in the Lane epoch-making contribution. Like all the other men who have been talking, I hold that it is distinctly not to be resorted to unless you have to do so. I have felt that all along, and only in the last eighteen months or two years have I become converted to the Lane method of fixation of fractures.

I have used it in several hundred cases of compound fractures of the tibia; I always go down, go in at once, correct it, and have never had trouble. In the past I have used wire to fix the bones in position, but since I have become converted to the use of the Lane plate I have employed it alone. It makes no difference if you do have to take the plate off later; you can make an incision and take it out. In the last case I made a small incision and took out the plate. In cases of compound fracture the plate has to come out, as a rule. In one of my cases the silver wire used for fixation remained in the tibia ten years and gave no trouble, as is seen in the lantern-slide picture I have just shown. We want to put ourselves on record as to the *best* methods of correcting vicious union and deformed fractures, and the best means is the open operation of getting the fractures in position so as to give the patient a strong, stiff, solid bone. I believe the time will come when we will not use other devices in the way of splints.

I was rather surprised to see Lane fix a fracture of the thigh in Chicago not long ago with nothing but fixation devices, and I believe I will come to it myself, because oftentimes it is not necessary to do otherwise. If we resort to immobilization we have a stiff knee, with a longer convalescence from the stiff knee than from the fracture itself. These things are very important because when a man gets a broken bone he wants a useful member. He dislikes a deformed member, and we are going to be driven to the point of giving him as good a member as he can possibly get. We should not overlook teaching medical students how to deal with fractures. Every effort should be made to do this. If, after repeated attempts, the bone cannot be placed in position, then we are supposed to cut down on the fracture. We should by no means operate on every case, but in those cases we cannot correct, as shown by repeated *x*-ray examinations, we are justified in cutting down.

CLINICAL SUGGESTIONS BASED UPON A STUDY OF PRIMARY, SECONDARY (CARCINOMA?) AND TERTIARY OR MIGRATORY (CARCINOMA) EPITHELIAL HYPERPLASIA IN THE BREAST

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The writer's reasons for making the following contribution to pathology and therapeutics of the breast may be briefly stated.

An examination of the literature reveals that there are at least one hundred and forty-seven different terms which are utilized to express pathologic mammary conditions. These are confusing to the great majority of practitioners, surgeons, teachers, and students.

Many of these terms are synonyms, an example of which may be seen in the fact that there are twelve synonyms for the condition which Billroth and Koenig described as "mastitis cystica chronica."

The classifications which have been and are utilized are numerous and very different. This may be seen also in the fact that the best authorities disagree upon the character of such conditions as "cystadenoma," "abnormal involution" and "senile parenchymatous hypertrophy." These may be found described by some writers as benign conditions and by others as malignant conditions.

The clinical uncertainty, which exists as a result of the confusion of terminology, the multiplicity of classifications,

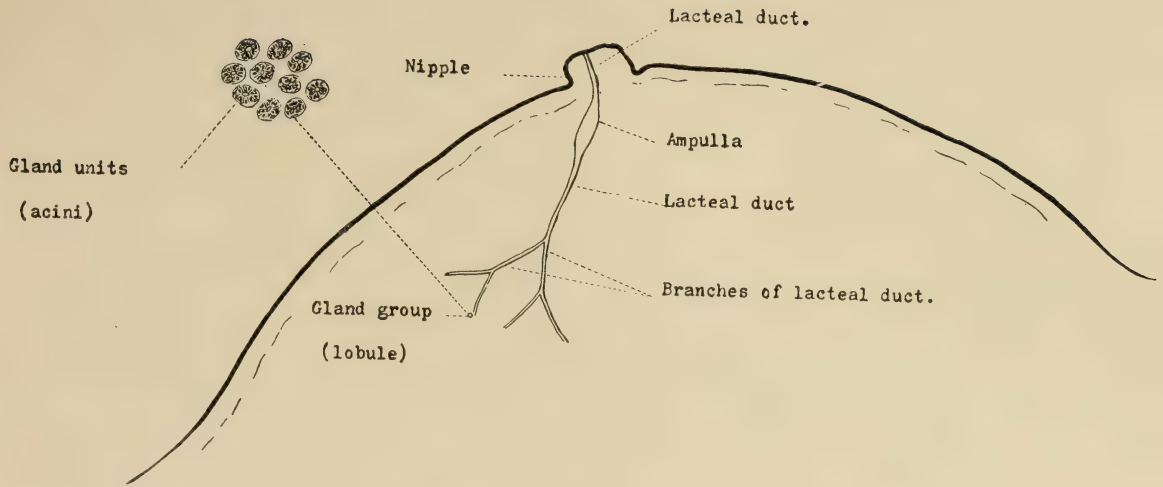
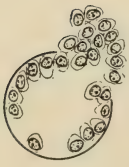


FIG. 1.—Diagram of the mammary gland.

Primary epithelial hyperplasia (not carcinoma).

Secondary epithelial hyperplasia (carcinoma ?).



Tertiary or migratory hyperplasia (carcinoma).

FIG. 2.—Diagram of the mammary acinus in, *a*, primary; *b*, secondary (carcinoma?), and *c*, tertiary or migratory (carcinoma) epithelial hyperplasia.

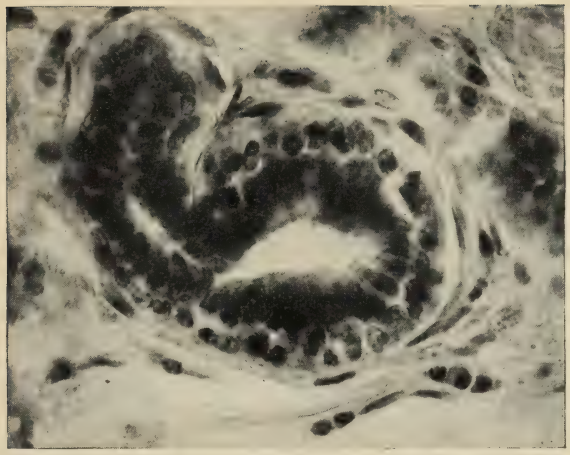


Fig. 3.—Primary epithelial hyperplasia.

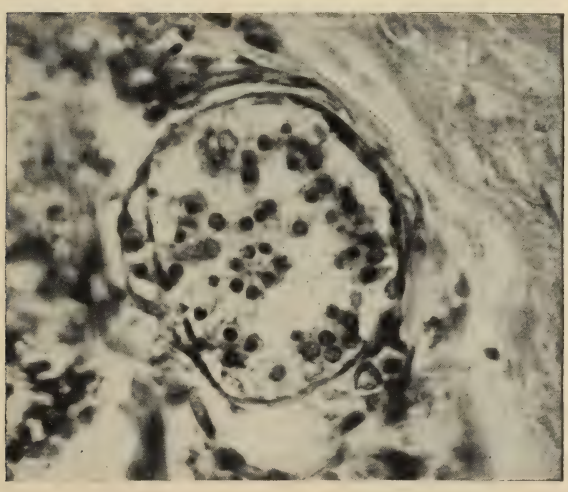


Fig. 4.—Secondary epithelial hyperplasia (carcinoma?).

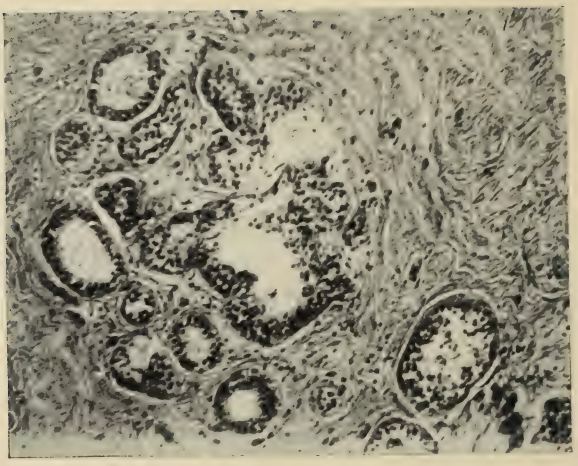


Fig. 5.—Tertiary epithelial hyperplasia (carcinoma).

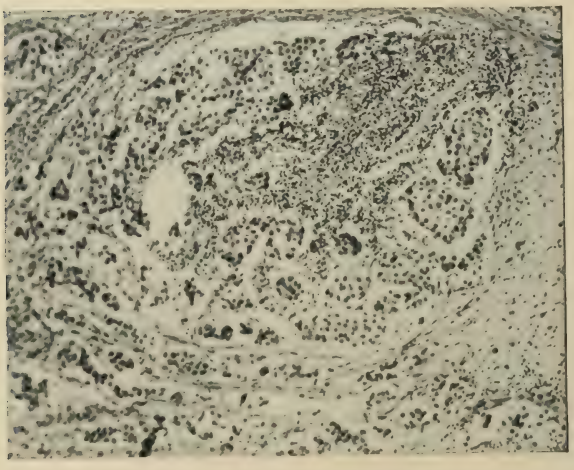


Fig. 6.—Tertiary epithelial hyperplasia (carcinoma).

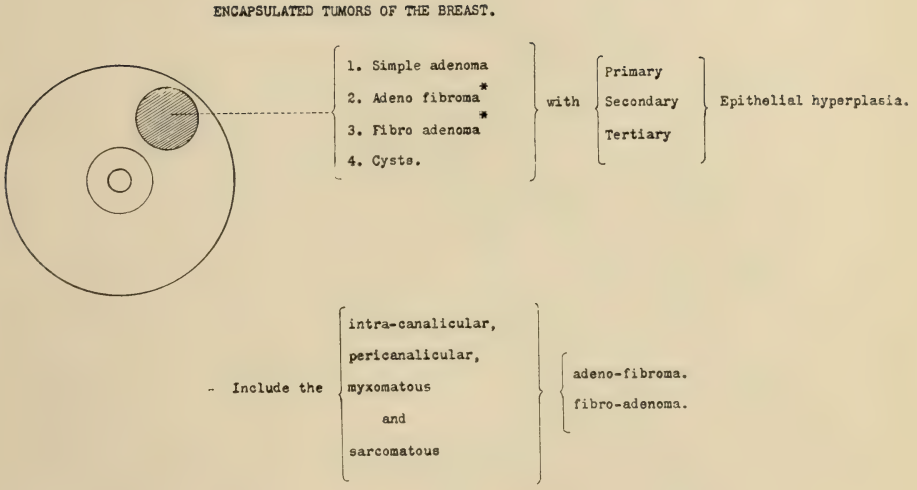


FIG. 7.—Diagram of encapsulated mammary conditions.

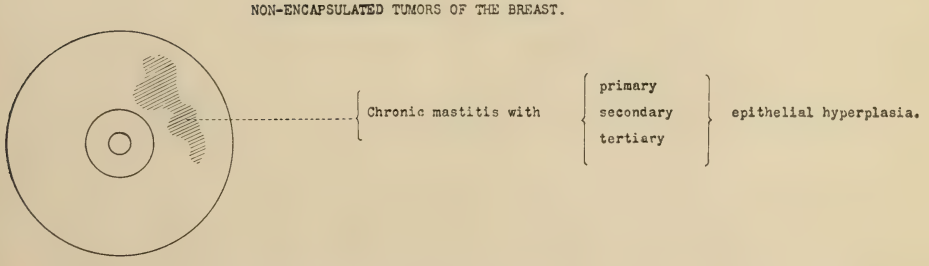


FIG. 8.—Diagram of non-encapsulated mammary conditions.

the divergence of operative advice from the general pathologist and the lack of recognition of carcinoma as a part of an epithelial hyperplasia, has led occasionally to radical amputations of breasts unnecessarily and also has allowed tumors which were clinically benign to remain in the presence of a possibility of malignancy.

The fact that general pathologists have recognzied only epithelial hyperplasia into the stroma as carcinoma has led to advice to the surgeon which has often proved to be disastrous.

The dogmatism relative to the role which the very indefinite "basement membrane" has played in being the histological arbitrary line of demarcation between benign conditions and malignant conditions has often retarded surgical radicalism which is, with our present knowledge, absolutely necessary in the treatment of cancer.

These existing conditions have stimulated a series of investigations of the pathology of one thousand breasts. It has been thereby shown that there are three definite histological pictures which form a logical basis upon which operative procedure may be carried out.

The mammary acinus (gland unit) (Figs. 1, 2, and 3) is composed of one row of columnar or cuboidal epithelial cells which are the functionating or secretory cells. These rest upon another layer of cells which are almost invisable in the normal breast but which become prominent when there is a chronic inflammatory reactive process present (Fig. 3). These correspond to the so-called "stratum germinativum" of the skin and are the cells which are the progenitors of the differentiated or secretory cells. They constitute the germinal cells of the epithelium of the breast. In the presence of chronic inflammatory reaction in the mammary gland one or more of three histological pictures are (Figs. 2, 3, 4, 5, and 6) seen regardless of whether the condition be encapsulated or non-encapsulated.

When the differentiated cells (inner row) and the undiffer-

entiated cells (outer row) are present, the histological picture may be spoken of as *primary epithelial hyperplasia* (Figs. 2*a*, 3). When the differentiated cells are absent and there remain only the hyperplastic undifferentiated cells of the outer row the conditions may be referred to as *secondary epithelial hyperplasia* (Figs. 2*b* and 4). When the line of demarcation between the hyperplastic undifferentiated cells and the stroma is indefinite or absent, and the epithelial cells appear in the peri-acinar stroma, the condition may be spoken of as *tertiary* or *migratory epithelial hyperplasia* (Figs. 2*c*, 5, 6).

Primary epithelial hyperplasia represents the usual reaction in chronic mastitis and is not considered to be malignant.

Tertiary hyperplasia or migratory hyperplasia is the histological picture of carcinoma.

Secondary hyperplasia is found described as "cystadenoma," "Schimmelbusch's disease," "Reclus disease," "senile parenchymatous hypertrophy," and "abnormal involution." It may or may not be malignant; it is placed in a benign group by some authorities and a malignant group by others.

The cells of the epithelium in this condition are often indistinguishable from the cells in tertiary hyperplasia, a characteristic which arouses a suspicion that the two conditions are intimately related if not a part of the same thing, namely, a malignant hyperplasia.

Without proof relative to the outcome in such a condition, one may state that secondary epithelial hyperplasia is a doubtful condition, a group which needs special attention during the next decade.

The practical application of a knowledge of the three apparent histological stages of hyperplasia may be readily seen in the fact that the life history of the most common pathologic conditions in the breast depends upon epithelial hyperplasia.

Mammary pathologic conditions divide themselves into two groups, *i. e.*, an encapsulated group (Fig. 7) and a non-encapsulated group (Fig. 8).

The encapsulated conditions to which special attention has been given during this investigation are the fibro-epithelial neoplasmas such as simple adenoma, adeno-fibromas, fibro-adenomas, and cysts in all of which epithelial hyperplasia occasionally occurs in all three stages.

Of the non-encapsulated conditions the most common is chronic mastitis in which primary, secondary, and tertiary hyperplasia are also frequently found in the same field of the microscope.

With the possibility of these conditions being present in cases in which the classical clinical signs of carcinoma are absent, the surgeon and the surgical pathologist must agree upon a scientific histological standard before any definite operative procedure will bring about scientific knowledge of prognosis.

At present surgeons have no very definite method or standard of dealing with the doubtful group. Radical operations are sometimes done where they are not needed, simply because the surgeon gives the patient the benefit of the doubt and the writer has occasionally seen carcinomas excised for benign tumors.

It seems that there should be a mean between the two extreme conditions and this mean should, with the aid of a knowledge of the stages of epithelial hyperplasia, serve to scientifically solve the following problems:

1. The percentage of cases of tertiary hyperplasia with or without glandular involvement which may be cured after an arbitrary period of ten years.

2. The percentage of cases of secondary hyperplasia which remain well or recur after the removal of the mammary gland itself without the removal of the lymphatic glands, muscles, and large amounts of skin.

3. The percentage of local chronic mastitides or encapsulated conditions which return later with secondary or tertiary hyperplasia after local removal.

The question for the surgeon to decide is whether or not he is willing to run the chance of local recurrences after wide local removal of a malignant condition followed by extensive operations after microscopic examination or take the credit of doing radical operations unnecessarily in an attempt toward conservatism.

This with our present knowledge can be only answered by conscience and not by scientific data.

The plan which suggests itself to the writer after an extensive experience with the pathologic conditions to be dealt with and also an intimate association with the activities of surgeons, seems to be based upon some known factors relative to the history of epithelial activities and the fact that surgeons differ regarding the extent of operations necessary in the conditions which have been described above.

1. The conditions which are associated with classical signs of carcinoma should be treated radically.

2. The doubtful cases in women near or over thirty-five years of age should have the entire mammary gland removed for immediate examination. If primary or secondary hyperplasia be present nothing more should be done; if tertiary hyperplasia be present a radical operation should be performed.

3. In doubtful cases near or under thirty-five years of age a wide sector of the mammary gland including the pathologic conditions should be removed for examination. If primary hyperplasia be present nothing more should be done. If secondary hyperplasia be present the rest of the mammary gland should be removed, and if tertiary hyperplasia be present the radical operation should be accomplished.

This plan avoids incision of tumors. It removes the

possibility of unnecessary radical operations and their physical and psychical embarrassment. It provides for a scientific means of determining more accurately the stage at which cancer may be cured by surgical operations and the extent of the operation which is necessary to effect such a cure.

In the experience of this clinic the removal of the mammary gland preceding an immediate radical operation has not been associated with earlier recurrence that has been found after a primary radical operation.

The plan is herewith presented with the realization that it is a conservative experiment which is based upon scientific facts. It is based upon actual research upon each specimen and is free from the incumbrances of extensive terminology and dogmatism relative to what is and what is not carcinoma.

It presents a means of actually determining what is clinically malignant.

It makes the surgeon an essential factor in the study of the biology of the epithelial cells and their relation to cancer. It will save many patients from unnecessary mutilation and will give radicalism its proper place in the treatment of cancer of the breast.

END-RESULTS IN OPERATIONS FOR CANCER OF THE BREAST

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The following is a review of the results of operations in our clinic for cancer of the breast from January 1, 1902 to January 1, 1912. It was originally intended to report all of the cases of mammary cancer that had been operated on more than three years, but in spite of the fact that we have endeavored for several years, through correspondence and personal communication, to complete our postoperative records, so far accurate data in many of the earlier cases has not been obtained. It seems best, therefore, to make this report cover the results of the ten consecutive years up to two years ago of which we have fairly correct knowledge, hoping to be able to complete the data on the earlier cases at some future time.

Previously it was customary to allow three years to elapse before making claims of a cure following an operation for cancer. It is undoubtedly true that many patients who pass through the first three years without recurrences do remain well, but it is also true that a certain percentage of them have recurrences and metastases at a period much later than three years. In view of this, it is difficult to say how much time should elapse before a patient operated on for mammary cancer may be said to be cured.

It is impossible to state what course these cases would have taken had they not been operated on, but, judging from the histories of similar though non-operated cases, it

is fair to assume that a goodly proportion of those operated on reasonably early have been either cured or at least have had an extension of life and a comfortable existence for many years. "Cases not operated on prove fatal on an average in twenty to twenty-eight months, the extremes varying from less than two months to more than twenty years" (Finney[1]).

The cases upon which our study is based are consecutive cases and none have been omitted from which postoperative data was obtained. Many operations were known at the time to be palliative, and were performed because of ulceration or the patient's extreme suffering. Many times these palliative operations were satisfactory, bringing relief and apparently prolonging life.

The principle in the technique of all the radical operations was practically the same and consisted in the removal of the entire breast, axillary glands, and fascia, including the pectoralis major and minor muscles in every case. These structures were usually all removed in one piece. In the evolution of the operation, the tendency in the later years has been to remove more widely the subcutaneous and deep fascia in all directions. In some cases it has been necessary to skin-graft the wound in order to close it, though in most of our cases we have been able to suture the skin flaps directly. In many of the cases we employed such plastic closures as those suggested by Jackson[2] and Rodman,[3] and have found them very useful.

It has not been our practice to remove the fascia and glands from above the clavicle. If these glands are palpable one is removed for microscopic examination to determine the nature of the enlargement. If the supraclavicular glands prove to be involved it has usually been our experience that the individual will live longer and more comfortably if not operated on. In some cases, however, especially when the lesion in the breast is in one of the upper quadrants and especially if there be attachment to the skin, we

believe that it is advisable to continue the dissection of the fascia and glands to the supraclavicular region. In most cases in which the glands were involved the individual has not lived three years. In one of such cases, however, the glands showed definite cancer and the patient is now living (over five years) without recurrence.

The diagnoses in all of these cases were made from both macroscopic and microscopic evidence. During the ten years from January 1, 1902 to January 1, 1912, we have operated on 608 patients with cancer of the breast. Six hundred and seven of these were females and 2 were males. One of the males is alive without recurrence three years following the operation. The other male died at the end of two years and eight months from recurrence.

Of the 608 cases, we have been able to trace and have fairly accurate knowledge of 514. No patients in this series died in the hospital, though three died within one month after the operation. Patient No. A7541 died at the end of two weeks when the wound was well healed; the autopsy in this case showed a large pulmonary embolism as the cause of death. Patient No. A46874 died at the end of the fourth week in diabetic coma. The wound had healed and the autopsy showed no carcinoma. Patient No. A22134: The wound did not heal and the patient developed septic phlebitis, dying at the end of the fourth week from sepsis.

In estimating the age incidence of carcinoma of the breast we found that the youngest patient was twenty-five and the oldest eighty-five years of age. Estimating the number of cases occurring in each decade we find:

TABLE I

20 to 30 years of age	13	patients
30 to 40 years of age	147	"
40 to 50 years of age	228	"
50 to 60 years of age	147	"
60 to 70 years of age	88	"
70 to 80 years of age	27	"
80 to 90 years of age	1	"

In one patient, aged twenty-six years, a tumor in the lower inner quadrant of the right breast was supposed to be benign, but as the time of removal it proved to be cancer. The wound was packed with gauze saturated with Harrington's solution and two days later a radical operation was performed. This patient is alive and without recurrence seven years and nine months after the operation.

One patient, aged twenty-five years, whose tumor was diagnosed malignant intracystic papilloma, at the time of the operation was nursing a nine-months-old baby. She is alive without recurrences over six years.

One patient, aged twenty-eight years, with carcinoma of the left breast and concerning whom the prognosis at the time of operation was considered to be good, except for her age, is well now after three years and three months.

One patient, aged twenty-six years, diagnosed early cancer of left breast, is alive with questionable local recurrence two years and nine months after operation.

One patient, aged twenty-eight years, with cancer of the right breast and axillary glands, recurring after a partial removal of the breast elsewhere one year before, is alive without recurrence two years and nine months after operation.

These cases are mentioned especially to show that mammary cancer in a young person is not necessarily hopeless, and that a good percentage of the cases coming for treatment early may be relieved for a long time, and that even in recurring cases a fair result may sometimes be obtained.

As will be seen from the table, many of our cases have occurred in the so-called cancer age—between forty and fifty years—and by far the greatest proportion between thirty and sixty years. Nearly all of the younger patients who remained well have been those who came for treatment early, before there was any evidence of extension to the lymphatics.

TABLE II.—Percentage of Deaths According to Ages.

		Based on number of patients heard from.				
	Ages.	Per cent. died within 1 year.	Per cent. died within 3 years.	Per cent. died within 5 years.	Per cent. died after 5 years.	Per cent. alive 2 to 10 years.
Total preclimacteric periods	20–30	0	0	0	0	5 patients
	30–40	20	46	55	1.0	43
		19	43	52	1.0	47
Total climacteric periods	40–50	20	45	50	5.0	43
	50–60	16	45	57	1.8	41
		19	45	53	4.0	42
Total postclimacteric periods . .	60–70	16	37	44	7.0	48
	70–80	7	50	50	7.0	43
	80–90	0	0	0	0	1
		13	39	45	7.0	48

In Table II may be seen the percentage of cases for each decade who have died in the first year after operation. We cannot explain why the younger patients have apparently done better than the older ones except that the great majority these patients come for treatment early.

TABLE III.—Results in Patients Operated on Over Periods of Three Years.

510 patients operated on more than three years.
427 patients have been traced.
234 patients have died.
191 patients are living.
44.7 per cent. of patients have lived over three years.
27 of these patients have recurrence at present time
19 patients died from other causes.

Of 514 patients whom we have been able to trace, 266 or 51.7 per cent. are known to be dead. Twenty-one of these died from other causes without clinical signs of recurrence. On several of these patients autopsies were performed and no recurrence was found. Subtracting these from the number who have died from cancer leaves 47.6 per cent. of deaths from cancer for the entire series. Two hundred and forty-eight of the 514 patients are known to be alive from two years to eleven years and four months; 37 of these living are known to have recurrences.

In 1902, 24 patients were operated on. Of these operated on more than eleven years, we have traced 19: 15 have died from various causes, and 4 are alive and have no recurrences. Thus, 21 per cent. of this series are now alive, over eleven years, and without recurrence. In each of these patients the carcinoma was in the left breast. The axillary glands were enlarged in two of them. One patient of this series who died had had a fairly radical operation elsewhere twelve years before. She came to us with recurrence in the skin and axilla. This was removed and she lived two years and two months after our operation for the recurrence. One of these early patients lived six years and nine months after the operation and died of arteriosclerosis without evidence of recurrence. One other patient lived six years without local recurrence and died of metastases in the liver.

Twenty-six patients were operated on in 1903. Of these we have been able to trace 21. Forty-three per cent. of this group of 21 are alive without recurrence. All of these patients have lived over ten years. Two in this series had been operated on for malignant disease in other organs. One patient had had a hysterectomy for carcinoma of the uterus two years before and one other had been operated on three months before for malignant papillary ovarian cysts.

Patients Living More than Ten Years. Of the patients operated on during the years 1902 and 1903 we have been able to trace 40. Twenty-seven are known to be dead from various causes, which leaves a percentage of 32.5 per cent. alive without recurrence more than ten years. Three of the patients who died lived more than six years and died from other causes.

Patients Living More than Five Years. Of the 321 patients operated on more than five years, 266 have been traced: 148 are known to be dead; 106 are living. This gives a percentage of 39.8 who have lived more than five years. Six of these patients have recurrence at the present

time. Fourteen included in these deaths have died from other causes.

Patients Living More Than Three Years. There have been 510 patients operated on more than three years, 427 of whom have been traced: 234 are dead, 191 are living, leaving a percentage of 44.7 of patients living more than three years. Of these 27 have recurrences at the present time and 19 are known to have died from other causes.

Late Recurrences. We have also in this series several who have died from carcinoma after being free from it for a number of years. In one instance the patient died nine years and one month after the operation from general carcinosis. One had metastases to the lungs 5 years and eleven months after operation. One had internal metastases six years and four months; another had metastases in the liver without any local recurrence, and died six years and five months after operation. In one instance we operated for recurrence twelve years after the primary operation, the patient remaining well nearly three years after the secondary operation.

We have known for some time that late recurrences following operations for carcinoma of the breast occur, but we have been rather surprised to find so many patients with late recurrence. In reviewing the literature on this subject we have found one case reported by Matas[4] with recurrence nearly twenty-five years after the first operation; and another reported by Ransohoff[5] in which there was recurrence nearly twenty years after the primary operation.

Our statistics do not bear out the supposition that excision of the tumor or a part of the breast followed by a radical operation within a few days or weeks means always a bad prognosis. For example, in one of our cases the breast was removed for supposed mastitis. This was found on examination in the laboratory to be carcinoma. It is our custom in such cases to arrange for an immediate radical operation in all instances if it is found to be necessary. In this par-

ticular instance, however, the radical operation was not performed until seventeen days after the incomplete operation. This patient is now living, without signs of recurrence, seven years and nine months after the operation. In another case a specimen had been removed one week before the patient came to our clinic, and at operation definite carcinoma of the breast was demonstrated. This patient at the present time is alive and free from recurrence six years and two months after the operation. In one other case, which is still more striking, the patient's breast was removed four years before. Some weeks after this operation she developed nodules in the axilla. These were treated by *x*-ray over a period of some months. We removed the recurrent masses and she has been living now six and one-half years without further evidence of cancer.

On the other hand, we have had five cases in this series in which a specimen had been removed elsewhere from three weeks to one year before our radical operation, and all of these patients died from two months to two and one-half years after the operation.

We have had several patients in whom both breasts were involved. If both were involved at the same time the prognosis, as a rule, was bad. If one had been removed and there was later recurrence in the other breast the prognosis was often quite favorable. In 1905 we operated on a patient whose opposite breast had been removed in 1899. She lived four years and eight months after the second operation.

In 1906 we operated on two patients in whom there was a very small lesion in the breast and no glandular involvement could be found. Macroscopically and microscopically the diagnosis was early carcinoma and we believed both were favorable cases. Both of these patients had early metastases and one died within two years. These two patients we think illustrate a certain group who in all probability at the time of operation have internal metastases or extension to the mediastinal glands without evidence

of such extension. We have seen several patients hopeless because of metastases to the liver, spine, or bones, and yet in whom the primary focus was small and free, and in whom no enlarged glands could be felt.

In this same year we observed two such patients with pathologic fractures of the femur. In both of these instances the fractures occurred five years after the operation. Metastasis to the bones has not been common, though many of the replies to our inquiries would indicate involvement of the vertebræ. Involvement of bone is usually late.

We have considered edema in the tissues as a contraindication to operating, because we believed that the lymphatics were all blocked by extension of the cancer. One of these patients in whom the prognosis was bad because of edema and who was operated on as a palliative measure is yet alive without recurrence five years and three months later. Cancer in the lactating breast has been most unfavorable. Of the 3 patients operated on, 2 have died within the first year; in the one exception the growth was an intracystic papilloma.

Functional Result. Special inquiry has been made regarding the ability to use the arm and shoulder following these operations, and a very large percentage of the patients have reported that their arms are all right or practically as good as ever. We have noticed that when it is necessary to destroy one of the motor nerves the function is much more apt to be impaired. The chief complaint of pain soon after the operation is usually in the arm, but in most of our cases this entirely disappeared within two weeks. We have made special inquiry regarding edema in the arm. Occasionally the swelling and edema has been very marked. Counting the patients with the edema and those who say they have some swelling of the arm at times, the entire group is not over 5 per cent. The edema as we have seen it occurs in two ways: First, as primary edema immediately following the operation. This is quite common,

and we believe it is due to a thorough removal of the lymphatics; it persists until collateral circulation in the lymphatics has been established. This is usually a matter of two or three weeks and can be relieved by early exercise and massage. Second, are those patients in whom the edema comes on late, several months or years after the operation. Here it is due to a recurrence of the carcinoma in the remaining lymphatics which have been draining the arm, and of course is permanent. In 4 patients we have removed the entire axillary vein down to the cephalic vein, taking care that the latter was not injured. The resulting edema was but slight and temporary. Even with the removal of the pectoral muscles, intercostals, part of the latissmus dorsi and serratus magnus, and all of the axillary fascia and lymphatics, in many of these cases the function of the arm and shoulder has been impaired very little.

TABLE IV.—Results in Patients Operated on Over Periods of Five Years.

321 patients operated on more than five years.
266 patients have been traced.
148 patients have died.
106 patients are living.

39.8 per cent. of patients have lived over five years.
6 of these patients have recurrence at present time.
14 of these patients died from other causes.

TABLE V.—Results in Patients Operated on Over Periods of Ten Years.

50 patients operated on more than ten years.
40 patients have been traced.
27 patients have died.
13 patients are living.

32.5 per cent. of patients have lived over ten years.
None of these patients have recurrence at present time.
3 patients died from other causes.
All of these three patients lived over six years.

Year.	No. of cases.	Traced.	Dead.	Alive, no recurrence.	Alive, with recurrence.	Per cent. alive, no recurrence.	Per cent. alive, with recurrence
1902	24	19	15	4	0	21.0	
1903	26	21	12	9	0	43.0	
1904	32	24	14	10	0	41.7	0
1905	51	43	23	18	2	41.8	46.0
1906	57	51	34	17	0	33.3	0
1907	52	50	28	20	2	40.0	44.0
1908	71	59	34	23	2	39.0	42.3
1909	94	79	42	29	8	36.7	46.8
1910	95	82	34	35	13	42.7	58.5
1911	97	86	30	46	10	53.5	65.0

CONCLUSIONS. 1. Results in operations for cancer of the breast are as good if not better than results in operations for cancer elsewhere.

2. The prognosis in younger people who received the benefit of an early operation was better than we had expected.

3. The prognosis is variable in a certain per cent. An extensive external involvement may give a fair prognosis, while a slight external lesion may terminate early from internal metastasis.

4. That metastasis may occur many years after the operation, though in the great majority of instances it will appear in the first few years if at all. The difference between the percentage of patients living over three to five and ten years is not as great as might be expected, but this is because most patients who die of the disease die within the first three or at least the first five years. Living five years without recurrence means a very small probability of trouble after that.

5. Comparing these results with those of former years we feel that the results are improving and that the improvement seems due to the fact that patients are coming earlier rather than to any improvement or change in the technique.

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DISCUSSION ON THE PAPERS OF DRS. MACCARTY AND JUDD.

DR. WILLIAM L. RODMAN, of Philadelphia (by invitation).—I feel that this series of papers is a very fitting close to a day of unusual interest and instruction. I do not recall when, in any society or at any time, I have listened to as many instructive papers, and interesting discussions as at this meeting. I enjoyed greatly the last two papers. It would be difficult for me to discuss the paper of Dr. MacCarty from the standpoint of a pathologist, yet I do know enough about pathology to feel satisfied that he has measureably clarified a very complex and difficult subject. There is no disease about which a greater variety of opinions have been expressed by so many authors than the one he has discussed.

I wish Dr. MacCarty had gone further and told us definitely what percentage of cases of abnormal involution at the Rochester clinic had undergone cancerization. I am unable to say even in my own series (because statistics are being examined at this time) what percentage of my cases have undergone cancerization, but I am able to say at this time definitely that it is more than 25 per cent. This, I think, is the crux of the whole question before us, so far as treatment is concerned, and indicates that one ought to be extremely careful before simply cutting into these breasts and removing a part for microscopic examination. Usually radical ablation of the organ is preferable, though exceptionally it may be avoided if every precaution is taken.

Dr. Judd spoke of the ages of these patients and reported a case of cancer in a male, aged only fifteen years. I am interested in this because only a short time ago Dr. Kennedy, successor to Dr. Joseph Price, operated in his institution on a girl only seventeen years of age for well-marked scirrhus of the mammary

gland. I saw the first specimen and microscopic slide because it (the former) was sent to the pathologist of the Medico-Chirurgical College for examination. Dr. Andrew McGosh reported to me in a private communication a case of breast cancer in a patient, aged nineteen years; Dr. Roswell Park, one in a patient aged twenty-two years, and the late Dr. Maurice Richardson one in a patient aged twenty-one years. We must recognize that cancer in its ever-increasing tendency is breaking down not only age, but racial and geographical barriers as well. Those who practice in the South know that negroes are no longer immune to cancer of the breast as they were fifty years ago, but are more liable to it than the whites. The same is true of the North American Indian, but to a lesser extent, as his immunity long since left him.

S. W. Gross says, in his book, that his youngest patient was twenty-eight years old, and the youngest case on record at that time was twenty-one years.

I want to emphasize a point upon which Dr. Judd laid stress, and that is, that while the prognosis in young women is undoubtedly graver than in elderly women, the fact has been over-emphasized beyond any doubt. In other words, I am surprised that a distinguished pathologist in a large hospital recently stated that women under thirty-five years of age, even after very early and very radical operation, rarely survived two years. I have had many such patients. My youngest patient with cancer of the breast was a woman, aged twenty-two years of age, operated in 1900, who has since borne two children, and is perfectly well today.

Another patient, who is now night superintendent in a large hospital in Baltimore, was operated in June, 1904, and is perfectly well. Not only was the mammary gland involved by scirrhus, but there was a moderate axillary involvement as well.

A third case was in a woman, aged thirty-one years, with marked axillary involvement. I told her physician that I did not believe she would live six months, basing my gloomy prognosis on her age and the extent of the disease found at operation. Last March, five years subsequent to operation, she called at my office, was examined carefully, and not a trace of the disease could be found.

More important than all of these was a woman, aged thirty-two years, who was five months' pregnant, sent to me from

Wilkes-Barre nine years ago. She was operated on for scirrhus cancer of the breast with moderate axillary involvement; she went to term and was delivered of a healthy child. I have heard from her within a month and she is perfectly well.

Now as to late recurrences; Dr. Ransohoff did much to clarify that subject in a paper he presented before the American Surgical Association five years ago. He showed clearly, as did also Coley, that recurrence took place after three years in only 15 per cent. of all cases; so that 85 per cent. are safe if they go three years without a recurrence, and after five years only 10 per cent. are liable to recurrence. Ransohoff expressed the opinion then, in which I concurred, that these late cases of so-called recurrence, the metastasis taking place ten, fifteen, twenty, or twenty-five years after, are to say the least questionable, and that they should be looked upon as instances of reinfection in persons of demonstrable cancer susceptibility. Can we conceive of a cancer focus in the stomach, the rectum, or uterus, none of which organs has a direct lymphatic connection with the breast, remaining dormant so long, and then suddenly lighting up and destroying its host? Moreover, we should recall about 35 per cent. of cancers are in the stomach, and 25 per cent. in the uterus, why then should not a woman cured of cancer of the breast, and who is, therefore, susceptible to cancer, be a victim to fresh infection somewhere else? It is absurd in my judgment to look upon these cases as late metastases unless they are accompanied by demonstrable regional recurrences or recurrences *in loco*.

Another point of great interest, and that is where do mestases occur? Although we were taught by Gross and others that they occurred more frequently in the lungs than anywhere else, Handley states that they are found more often in the liver than anywhere else. He believes that cancer cells permeate along the deep fascial planes to the umbilicus, thence along the round ligament into the free peritoneal cavity, and then by selective affinity find their way to the liver. I am finding more late recurrences in the bones than in either liver or lungs, and in the vertebræ rather than in the long bones, although I have had them in the long bones, especially the humerus and femur.

Finally, Dr. Judd spoke of my method as a plastic method. It is not such. In fact, I have definitely put plastic measures to one side. They are alluring, but oftentimes deceptive. Although they may enable one to close a wound of large size without

difficulty, they at times do so at the cost of leaving infected tissue behind. To my mind a plastic procedure is one where you make a flap precedent or subsequent to an operation or usual incision, and make it with the idea of closing the wound. That is what I have in mind by a plastic procedure. In making my incision I get beyond the probable ramifications of the disease. Although I make a very large wound, larger than any I have seen, neither skin grafting nor flaps are necessary to close it. The whole thing is accomplished by undermining in every direction. I have not failed to close a single wound in more than one hundred consecutive cases. Drainage I have also abandoned as unnecessary. The wounds heal quickly, patients leaving their beds in forty-eight hours, and the hospital in ten or twelve days. Union *per priman* nearly always occurs. I have had no operative mortality in fourteen years.

Dr. Thomas S. Cullen, of Baltimore, Maryland.—We are indebted to Dr. MacCarty for the simple classification he has given us. Very frequently the pathologist leaves out of consideration the view-point of the surgeon, and I think the simpler a classification can be made the easier it will be for the general surgeon. We have tried to adopt a simple classification in the consideration of cancer of the uterus.

I would like to mention the fact that the histological picture of hypertrophy of the lactating breast, hypertrophy of the endometrium associated with pregnancy, and hypertrophy of the thyroid, bear a marked resemblance to one another.

With regard to late metastases, I have seen metastases from cancer of the body of the uterus eleven years after operation. These metastases were found in the lumbar glands at autopsy.

The admirable report of Dr. Judd shows what can be accomplished by carefully keeping track of patients. I know of no other clinic in America that can trace its patients so well. This is in a large measure due to the careful and systematic manner in which all patients are handled, coupled with the fact that practically all of the patients are private patients.

In many hospitals where colored patients are treated these from their shiftless character soon disappear from sight and are never heard of again. Further, a certain class of white patients migrate frequently and are likewise completely lost track of. It is to clinics so fortunately situated as the Mayos clinic that we must look for the most complete and valuable records.

Dr. Judd, in concluding, said that he felt that these cases

of cancer were coming to us earlier. We have been endeavoring for over a year to carry out a campaign of publicity. This campaign had its start in the Clinical Congress of Surgeons of North America in New York, November, 1912. Dr. Franklin H. Martin, Secretary of the Congress was in a large measure responsible for the campaign. After the Chicago meeting of 1913 he said that the laity had learned more about cancer during the last year than in the preceding twenty years and, further, that the campaign had already borne much fruit.

One surgeon told me that as a result of Mr. Adams' article in the *Ladies' Home Journal* he had operated on six early cases of cancer, showing what one man has been able to do as a result of this article. I think we owe a debt of gratitude both to Mr. Adams and to Mr. Hoffman who have been carrying on this work.

Last year the work of the committee of the Clinical Congress of Surgeons was endorsed. This year we have still another committee doing excellent work, namely, the American Association for the Control of Cancer. I would like to move, Mr. President, that this Association give its approbation to this new committee, which is working along the same lines as the committee of which I happen to be chairman. (Motion seconded and carried.)

Dr. J. Shelton Horsley, of Richmond, Virginia.—The classification given by Dr. MacCarty is so simple and so clarifying that it is, in my judgment, the best method of classifying cancer of the breast, both pathologically and clinically, since Warren's paper. If he could tell us some general way of classifying abnormal growths of the ducts, we would have the whole thing in a nutshell.

The statistics of Dr. Judd are remarkable and excellent. They will become more valuable as time goes on, because there is no clinic where there is such close and intimate association and such harmony between the operating surgeon and pathologist, and where neoplasms can be classified so accurately and the patients so carefully traced.

Dr. Willis F. Westmoreland, of Atlanta, Georgia.—In those cases of bad family history my experience has been that if I have a patient presenting with a carcinoma of the breast, and the family history is bad, I always expect a bad prognosis, regardless of how early I get the case.

In regard to late metastases, it was Snow who pointed out,

fifteen years ago, that late recurrence was due to primary development in bone; that there was infection of the bone from carcinoma which lay dormant, and secondary recurrence, particularly in the late cases, occurred from that source. I have not seen anything concerning that view since that time. The fact that we have so many cases of late recurrence and they are increasing and are occasionally associated with bone, may be a point of interest for the men who have had so much experience to look into.

Dr. Frank Martin, of Baltimore, Maryland.—I have recently seen two cases of carcinoma of the breast operated by my chief, Dr. McLane Tiffany, one twelve, and the other fourteen years ago, that had recurrence.

Dr. William D. Haggard, of Nashville, Tennessee.—I want to speak of one patient who was operated by my father twenty-seven years ago, and who, at the present time, is free from recurrence.

Dr. MacCarty (closing the discussion on his part).—I appreciate the remarks which have been made. I wish I were able to answer all of your questions.

In regard to the percentage of cases of so-called abnormal involution, which became cancer, I must say that I am unable to state any facts. I have never seen a cancer of the breast in which I could not show a picture which would correspond with the pictures which have been called "abnormal involution."

I have an interesting series of lantern slides, photographs, which were made from articles published by various men showing "abnormal involution" and "senile parenchymatous hypertrophy." These pictures are varied and their characteristics may be projected side by side with photographs of different areas of non-carcinomatous portions of carcinomatous breasts. "Abnormal involution" is present in practically every case of carcinoma of the breast I have ever seen.

In regard to Dr. Cullen's remarks relative to cancer of the uterus, I may say that I have known of the three-stage proposition for a number of years. In fact, I suggested it about three years ago at a meeting of this Association held in Nashville, but have elaborated it since. I have been studying cancers of all organs, and have been trying to let the organs adapt themselves to this grouping.

I am able to state that primary, secondary, and tertiary hyperplasia may be seen in the uterus and prostate. I hope

some day to prove that it is true in all organs, and to be able to scientifically state that we are dealing with a definite process of epithelial hyperplasia of which carcinoma is but a part. I know it is true in the breast and I hope it will be true in other organs.

Dr. Horsley's question in reference to hyperplasia in the ducts in the breast may be answered by stating that primary, secondary, and tertiary hyperplasia occurs in the mammary ducts in a similar manner to that in the acini. I have been unable, on account of time, to present facts upon this question. However, I shall do it in the next year and a half.

In regard to Dr. Westmoreland's suggestion about the family history. There is not sufficient data upon which to base anything relative to the hereditary influence of cancer.

I wish to thank the officers and members of the Association for allowing me the privilege of presenting my material and of affiliating with you in this most interesting meeting.

Dr. Judd (closing the discussion).—I do not wish to be understood as speaking of the Rodman operation as a plastic operation, because I think we all feel that in a strictly plastic procedure we might save tissue that should be removed. Professor Halsted said the man who makes the incision should not be the man to close it, meaning that eradication of the disease came first and closure of the wound second. The first thing is to remove radically the carcinoma, and then close the incision in the best possible manner we can, either with or without skin-grafting. We frequently use technically different methods.

I want to say for the benefit of Dr. Cullen that I am sure we have had many more than six cases of lumps in the breast come to us early, directly through the work of this Cancer Commission.

HYDROCEPHALUS INTERNUS. LUMBAR DRAINAGE BY UTILIZATION OF A MENINGOCELE SAC AS A DRAINAGE TUBE

By Herbert P. Cole, M.D.
Mobile, Alabama

Anatomical investigation has disclosed that the regulation of cerebrospinal fluid pressure is dependent upon the venous and lymphatic circulation. This has been established largely through the investigations of Leonard Hill. The communication between the intraventricular and paraventricular spaces lies in five routes, viz.:

1. Through the foramena of Majendie and Luschka in the roof of the fourth ventricle.

2. Into the longitudinal sinus through the intermediation of the Pachionian bodies from the arachnoid space.

3. Through the lymphatics of the cerebral nerves, by the prolongation of the arachnoid upon their roots, especially the optic, olfactory, and auditory nerves.

4. Possibly there is a communication with the nasal mucous membrane.

5. Communication with the spinal arachnoid space through the cisterna magna.

It is evident that the internal type of hydrocephalus is therefore amenable to treatment by establishing communication between the internal and external spaces. Obstruction to one or more of these routes will disorganize the cerebrospinal pressure resulting in dilatation of one or more of the ventricles. This dilatation may take place in

any of the ventricles, though more rarely in the fifth ventricle. In one autopsy specimen in an embryo a dilatation of the fifth ventricle alone has been observed, leading to the suggestion that this ventricle may have some hitherto unsuggested internal secretion functionating in the fetus.

1. Hydrocephalus may be congenital or acquired, internal or external. It is a symptom rather than a disease. It results from diseases of the cerebellum, corpora quadrigemina, and crura cerebri, interfering with the choroid plexus and thereby causing an obstruction of the foramena of Majendie and Luschka.

2. It frequently results from cerebrospinal meningitis, syphilis, and chronic infections.

3. Arrested brain development. Styles, the first advocate of this latter theory, attributes the failure of the usual operation for hydrocephalus to this theory.

Medicine has ever proved futile in the treatment of this condition and the surgical treatment of hydrocephalus dates its inception with the earliest days of surgery.

One might establish the surgical history of hydrocephalus in two periods, the first, including the procedures in which simple arrest of the disease was attempted through bandaging the rapidly developing congenital cases, and the early attempts at external drainage by puncture through the fontanelles. These efforts were never founded on an accurate knowledge of the pathology of the condition and the same may be said for subsequent more surgical procedures such as subtemporal or subdural drainage.

Subtemporal and subdural drainage have been advocated by Miculicz, Keene, Mayo Robson, Broca, Southerland, and Watson and Morton. These surgeons have used various substances to establish drainage tracts such as strands of catgut, horsehair, Cargyle membrane, various types of tubes, and prepared arteries and veins.

Hudson has advocated the use of silver wire drainage tubes attached to a silver wire filigree subtemporal mat. All of

these procedures have been attempted without accurate knowledge of the normal drainage routes and have aimed either at drainage direct from the lateral ventricles through the skin, or underneath the muscles, or to the subdural spaces.

Almost without exception the foregoing procedures have resulted in ultimate failure; temporary improvement has occurred in some cases, as case of Broca's, reported as successful, not having been followed sufficiently to warrant any definite permanent conclusion.

Bruce and Styles advocated and, in one case, established drainage through the roof of the fourth ventricle. Temporary improvement ensued and was later followed by death. Von Bramen and Antone and Rehm have advocated Callosal puncture for the drainage of the lateral ventricles into the subdural spaces apparently with beneficial results in certain congenital cases, in some cases of epilepsy, and in cases associated with meningitis and cerebral tumor. Balance has advocated the ligation of both carotids at intervals of several days in an effort to retard the intracerebral pressure. Pays has advocated drainage of the lateral ventricles directly into the longitudinal sinus, where there is a lower pressure, by inserting a portion of the saphenous vein into the sinus, the other portion being inserted into the lateral ventricle, the venous valves preventing back flow from the sinus into the ventricle.

More recently Pussep (*Arch. f. Kinderheilkunde*, 1912, Band xcv, Nos. 3 and 4) has advocated subarachnoid tube drainage through a trephine opening, the tube ending in a dural flap and repeated aspirations through the scalp at the trephine site for the removal of excess of fluid. The tube is later removed.

He has operated on twenty cases, eighteen being children. These were largely cases of chronic hydrocephalus, though cases of acute hydrocephalus and hydrocephalus due to brain tumor were also treated. The immediate results

were encouraging and there was but one death possibly attributable to the operation.

The multitude of procedures advocated for drainage from the ventricles into the cerebral arachnoid spaces or into the muscles is sufficient evidence that as yet a satisfactory method has not been evolved. The almost universal failure of these procedures is additional evidence that they are not the routes of choice. The only cerebral procedures that appear to be based on anatomical principles are those of von Bramen (the Calossal puncture), that of Pays (drainage into the longitudinal sinus) and that of Pussep (subarachnoid drainage combined with subtemporal aspirations).

The investigations of Cushing appear to offer a more logical and natural route of drainage through the spinal arachnoid spaces into the subperitoneal spaces, in the type where there is no obstruction between the ventricles and the spinal spaces.

Heile has sutured the meninges of the cord to the peritoneum of the large intestine in an effort to establish such a communication. Ferguson has inserted a silver wire through the fifth lumbar vertebra from the spinal to the peritoneal cavity. Nicholl has proposed the resection of a spinal transverse process and the insertion of a tube of decalcified bone or glass from the spinal to the peritoneal cavity. He has established such a communication by suturing a tag of omentum to the spinal meninges.

In a number of cases, where he has disclosed the communication between the cerebral and spinal spaces by simultaneous cerebral and spinal puncture, Cushing has placed a cannula through the fifth lumbar vertebra connecting the subarachnoid space with the peritoneal cavity. This apparently later establishes a direct subperitoneal drainage where the fluid is taken up by the receptaculum chyli. He believes that this method is especially valuable in cases of hydrocephalus complicated by spina bifida, in which a radical closure is established in the posterior portion

by the operation. He has carried out subperitoneal drainage in twelve cases, with a considerable measure of success.

I report the following cases as illustrating the feasibility of relieving hydrocephalus internus by spinal drainage in a case where a communication exists between the cerebral and spinal spaces, the end-results illustrate the necessity of maintaining the drainage by a stiff-walled drainage tube of some material.

CASE REPORT. Kathleen K. White, female, infant, aged six weeks. Family history, negative in relation to patient. Past history, prolonged difficult birth, at which time both thighs were fractured. The prolonged birth was probably due to a deformity of the child's spinal column. The child has nursed normally and has apparently normal rectal and vesical function.

Present Illness. At birth there was a marked kyphosis of the lower thoracic vertebra, above this there was a round fluid tumor mass apparently a meningocele.

A few days after birth this kyphotic area broke down and suppurated for two or three weeks, being healed with great difficulty. About ten days ago a gradual enlargement of the head was apparent, bulging of the anterior fontanelle. This has been becoming gradually more pronounced. Since birth there has been a slight spastic condition of both legs, with a tendency to adduction. There has apparently been no loss of sphincter control of the bladder or rectum. Until three weeks ago the patient complained when irritated about the perineum, indicating sensation present in that area.

Physical Examination. The child lies with head extended, the thighs flexed and adducted, the legs extended and spastic, bilateral pes equinus. The facial expression is normal except for a Mongolian type of right eye. The face begins to show the slight querulous expression seen in the later stages of hydrocephalus. The mucous membranes are normal, no general glandular enlargement, no evidence of syphilis or tuberculosis, von Pirquet negative.

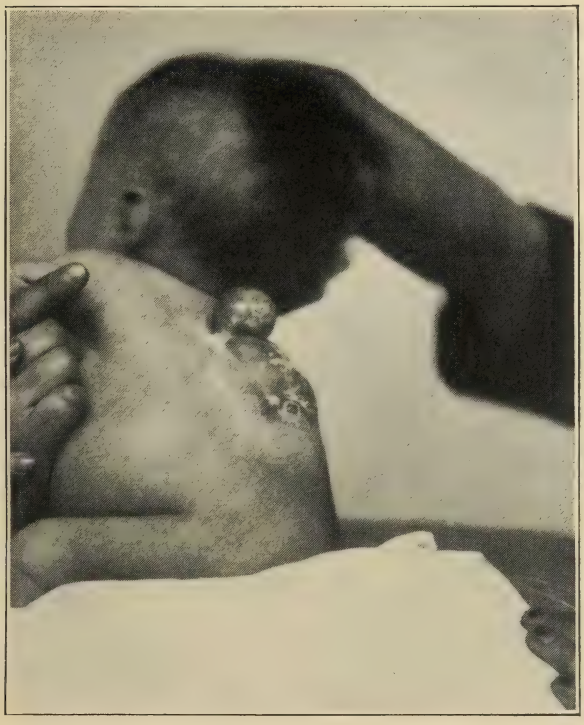

FIG. 1.—Kathleen K. Note spina bifida formation and presence of meningocele.

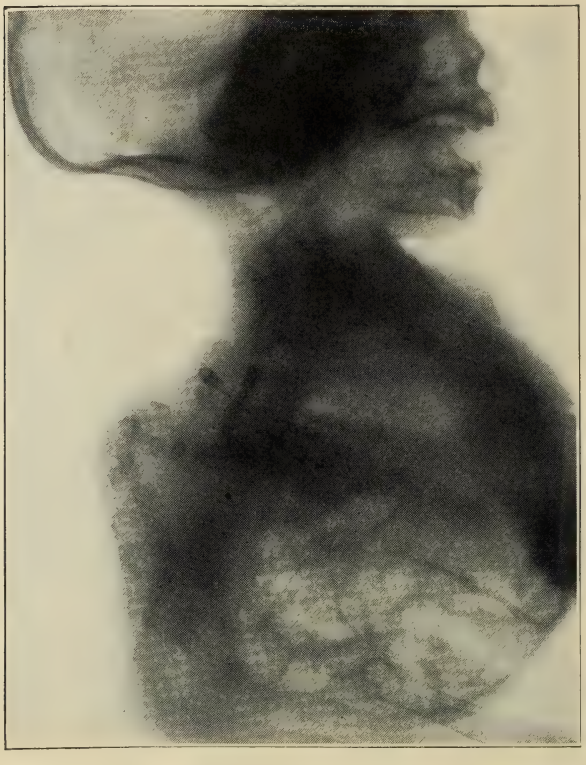

FIG. 2.—Kathleen K. Note marked kyphosis and non-fusion of transverse processes. Note hydrocephalus.

Head. There is a general globular enlargement of the cranial portion of the head, the distended veins, the taut skin, and bulging fontanelles of the typical hydrocephalic. The nasiobregmatic measurement is 23.5 cm. The largest circumference 2 cm., above the external auditory meatus is 40 cm. The transverse diameter measuring between the external auditory meati is 23 cm. The sagittal and longitudinal sutures are ununited. The skin is bulging and pulsates with respiration. The head is drawn well back to the cervical muscles so that the occiput approaches within an inch of the cervical vertebræ.

Thorax. There is a marked bulging on the left side of the thorax, a flattening on the right, apparently a birth deformity. The cardiac sounds are apparently normal for a child of this age. In the lower dorsal portion of the spine, there is a marked kyphosis extending over the sacral and thoracic vertebræ. Here there is a typical spina bifida formation with absence of several of the vertebral arches. The cord evidently lies immediately under the blue meninges, which are apparently fused with the skin on either side. (See illustration.)

In the mid-thoracic region, about two or three vertebral spaces above the upper border of the spina bifida formation, there is a smooth globular sac projecting from the skin in the midline. This sac is evidently a typical meningocele formation about 6 cm. in diameter and communicating with the subarachnoid space of the cord by a small pedicle. This sac evidently contains clear cerebrospinal fluid. There is a complete sensory paralysis below the mid-portion of the spina bifida. There is evidence of some motor tracts persisting in the occasional adductor response from tickling the perineum. There is also apparent sphincter control of the anus and bladder. The spastic condition of the legs and thighs together with a chronic flexion of the right great toe indicates that a deep lesion due to pressure on the cord has been present for some time, that the lesion is an irritative one, and that there are some motor fibers remaining.

Diagnosis. Spina bifida, meningocele, hydrocephalus congenitalis interna, thoracic kyphosis, lower sensory paralysis, motor irritative lesion of thoracic portion of the cord, spastic diplegia.

Operation. In the light of the hopeless future offered by medical treatment, and with the hope of arresting the progress of the rapidly developing hydrocephalus, direct drainage of the cerebrospinal spaces was established by burying the meningocele in the lumbar muscles.

Providence Infirmary, April 2, 1913, after administering a few drops of ether, an area about the spina bifida and meningocele was infiltrated with quinine and urea, the spinal cord itself was also infiltrated with quinine and urea near the meningocele sac.

Upon opening the meningocele sac a small stream of clear cerebrospinal fluid arose from a small bony communication with the canal. There was no evidence of cord tissue in the sac. The edges of the sac were everted and sutured into a lateral deep incision into the lumbar muscles. The skin was sutured to the sac by interrupted suture. The child's condition being excellent, I then dissected the skin from above the cord and its membranes over the spina bifida. The cord was found to be about one-third its normal diameter, flattened anteroposteriorly in its membranes. Carefully dislocating the cord laterally I was able to chisel a groove one-half inch deep through two of the vertebræ forming the prominent portion of the kyphosis. The cord was laid back in this groove, wrapped in Cargyle membrane, and the skin sutured over all.

The patient was much depressed at the end of the fifty minutes' operation, but soon recovered from the temporary shock.

Postoperative Examination. Within three hours of the time of operation there was a reduction of 3 cm. in the greatest circumference of the head. The patient lived twenth-six days after the operation, suffering marked

gastro-intestinal disturbance and eventually dying from inanition. The drainage tract functionated splendidly for the first two weeks. There was marked relief in the retraction of the neck and persistent reduced diameter of the skull. The day following the operation, the skin that was formerly tense and bulging over the anterior fontanelle and saggital suture became lax and lay loose, sunken into the skull cavity. It appeared that the drainage sac which was drawn rather taut into the lumbar space required a certain degree of intraspinal pressure to force the fluid through the small opening in the sac at the spinal portion. We would note occasionally that the fluid would accumulate in the skull cavity to the point of tension of the skin over the fontanelle, and a few hours later this fluid would have drained out. On one occasion this occured to such an extent that the parietal bones overlapped. On other occasions, when the skull was distended with fluid, continued pressure over the fontanelle would force the fluid through the sac. These evacuations were always followed by relief of the neck retraction and never associated with convulsions.

There was no leaking about the suture lines. The child began to increase in weight a few days after operation, but on the fourteenth day it was noted that the fluid was not draining. The sac was loosened and the opening to the cord was dilated, the sac sutured back into place. Drainage persisted for twenty-four hours, when the obstruction again returned, apparently due to edema of the sac membranes. From this time until death it was necessary to dilate the opening into the sac every few days. There was apparently an obstruction at the junction of the sac with the cord membranes. One could readily note the appearance of the obstruction by the restlessness of the child, later convulsive movements of the arm and face muscles, and a peculiar whining, animal-like cry. The fontanelles would bulge and be tense to the touch. Each time after

freeing the opening there would be a relief of the pressure symptoms, and for a short period the tissues over the fontanelles would be relaxed and soft, and there would be a decrease in the circumference of skull. From the time that the frequent openings in the sac were necessary, there was more or less constantly seepage of cerebrospinal fluid into the dressings.

After the tenth day there was a more or less constant diarrhea, and the child gradually lost weight. At no time was there any distinct loss of sphincter control. At no time was there any definite improvement in the reflexes of the lower limbs. Several days before death, which occurred on the twenty-eighth day, the child lost all visual reflexes. The child died after several hours of hypopyrexia, during which time the convulsive movements of the arms were almost constant.

Postmortem Examination. An autopsy was not permitted, but through a small incision in the posterior fontanelle I was able to determine that the lateral hemispheres had been almost entirely destroyed, only a small, thin sac wall representing the remains. Lifting up the meningocele sac, I found almost entire obliteration of the sac at the neck where the sac was given off from the cord membranes. At the point where the sac was inserted into the lumbar muscles there was an oval-shaped glistening depression that appeared to be covered with a thin layer of tissue other than the normal musculature. It would have been interesting to have ascertained the circulatory and lymphatic vessels in this new tissue formation.

Conclusions. Hydrocephalus internus is due to the obstruction of one or more of the natural drainage routes of the cerebral fluid.

A knowledge of the anatomical drainage routes of the cerebral sinuses is essential to the application of surgical drainage in cases of hydrocephalus.

Calossal puncture, drainage by the longitudinal sinus,

and the combined subarachnoid drainage and aspiration method of Pussep seem to be the cerebral routes based on anatomical principles.

Drainage through the spinal spaces appears to offer a better field of experimentation where careful investigation discloses communication with the intracerebral spaces. The route is more accessible than the Callosal route, less difficult to perform than the longitudinal sinus procedure, and an eminently more surgical procedure than the repeated aspirations of Pussep's method.

Drainage by the spinal route may be either subperitoneal or intramuscular.

A meningocele sac may be utilized as a drainage tube, but should be supplemented by an intrasaccular tubular drain.

The tender age of the subjects, the usual accompanying destructive lesions of the hemispheres and the often attendant malnutrition will keep the surgical treatment of hydrocephalus internus a treatment for alleviation of symptoms and arrest of progress rather than one of radical cure.

DISCUSSION

Dr. J. Shelton Horsley, of Richmond, Virginia.—I had a case of hydrocephalus some years ago on whom I did a number of operations, but the patient finally died. I learned a little more about hydrocephalus than I knew at the beginning.

We all remember that Hilton in his classic work on "Rest and Pain" dwells upon the question of hydrocephalus; although the book was written more than sixty years ago some of the things still hold. Hilton attributed hydrocephalus to an obstruction at the aqueduct of Sylvius, or the foramen of Key and Retzius, where the cerebrospinal fluid gains access to the subarachnoid space. But there is another method, and that is hypersecretion. To go over the points briefly, the cerebrospinal fluid is formed in the lateral ventricle and comes chiefly from the choroid plexus. There may be a damming of the

output, a large quantity of the fluid is dammed back, so that very little or none of it escapes. Provide a free outlet into the tissues and the choroid plexus secretes more than can be absorbed. In any treatment of hydrocephalus we must look out for both of these etiological factors. Both have to be taken into consideration; hypersecretion on the one hand, and the possibility of blockage on the other. Any operation, I believe, that depends upon the absorption of the fluid by connective tissue will fail. It did in my case, and if you should try hypodermoclysis in the same place indefinitely the water would soon cease to run, because in the course of time the lymphatics would be plugged, the hyperemia would produce scar tissue, and you would be injecting fluid into a mass of hard scar tissue.

The cerebral cells are easily injured and any method that depends upon raising the pressure in the brain or lateral ventricles to such an extent as to force fluid into the subcutaneous space will be so destructive to brain cells that the pressure will do more harm than the little fluid that escapes will do good. The most logical method would be this: first of all, drain the lateral ventricles by the insertion of a cannula and then a silver tube directly into the lateral ventricle and let it drain externally. This gets rid of the excess of fluid and induces hyperemia in the choroid plexus. What do you do when you want to get rid of the hypersecretion of a cyst? When you take away pressure by drainage there follows hyperemia and then the secondary formation of connective tissue, and as the connective tissue forms it squeezes the secreting cells and destroys some, and there is a diminution in secretion. The same thing occurs in cirrhosis of the liver. As the connective tissue increases there is a decrease in the liver cells. If this is continued a few weeks until there is a chronic hyperemia and cirrhosis, there will be decreased secretion. Then you can open the skull and establish a fistulous opening to the subarachnoid space. If this is done at first an internal hydrocephalus is merely converted into an external one. By drainage and so diminishing the secretion of the choroid plexus the arachnoid can take care of it and by a secondary operation later on the fistula can easily communicate with the subarachnoid space and the diminished amount of cerebrospinal fluid will be absorbed in a normal physiological way.

Dr. Charles H. Mayo, of Rochester, Minnesota.—This paper brings up a most interesting subject; namely, the ques-

tion which pertains to secreting organs throughout the body. We have various methods for taking care of the excess of fluid—the Talma-Robinson operation, the glaucoma operations, etc. We have the association of microcephalus from a lack of fluid; with hydrocephalus, too much fluid. The weak point or failure in the closure of the spinal laminæ due to pressure is when spina bifida occurs, but they all belong together. There is a break in the equilibrium between production and absorption. It was formerly believed that these patients should be operated on. As a rule these patients die if they are operated on. Sometimes the Lord steps in and helps the case, because we see certain cases with hydrocephalus that live for many years. I recall one, the case of a young man, who when a boy, had an enormous head. He is forty years of age now, still has a large head, and was literally covered with bumps and bruises on account of his head's enormous size. I have seen a few such cases. Operation is advised in some of these chronic conditions, but I do not believe that permanent drainage can be established. Why does the fluid increase? That is the point I want to bring up.

I have also operated on patients in whom there was microcephalus with large spina bifida, and the death which takes place is always a cerebral death, with the eyes turned up, twitchings, etc.

Long ago I worked out a scheme for operating on these cases. In dissecting off the sac, leave just enough to get closure. After that, provide autodrainage. After closing the neck, pass a double strand of catgut through its lumen and with a large needle spirally pass it about the neighboring tissues of the back for autodrainage, closing the external wound without drainage.

SURGERY OF THE PANCREAS

By R. C. Coffey, M.D.
Portland, Oregon

In 1908 I took up an experimental study, with the view of determining what might be done surgically with the pancreas. Up to that time some brilliant empirical work had been done, particularly in connection with pancreatitis, but very few definite surgical principles had been established. Pancreatic surgery had been considered very difficult and dangerous. The subject was taken up with the idea that the fundamental defect of the pancreas, so far as surgery is concerned, is that in the human it is largely retroperitoneal, and therefore lacks the universal repair material of the abdomen, which is peritoneum. It was evident to me at that time that the one essential step, therefore, in pancreatic surgery is to provide living peritoneum which may be brought to the field of every pancreatic operation. The most serious problem which has confronted the surgeon is fat necrosis. Our experiments confirm those of Opie and others, that fat necrosis occurs only when pancreatic fluid is poured into and confined in the retroperitoneal fat, and therefore may extend by direct continuation into all the extraperitoneal fat surrounding the abdominal cavity, into all the mesenteries, into the greater, lesser, and gastrosplenic omenta. On the other hand, it is found that when the pancreatic fluid is delivered inside the unbroken peritoneum, a local chemical peritonitis is set up, which does not produce fat necrosis because the peritoneum resists it.

If the pancreatic duct is severed and the end so arranged that all the pancreatic fluid is poured into the peritoneal cavity, no harm results, provided a sufficient quantity of protected gauze drainage is placed to readily conduct the pancreatic fluid to the surface, in other words, the severed or split pancreatic duct may be treated just as we would treat the common bile duct under similar circumstances.

Following out the suggestion of Desjardin, we experimented with dogs and found that stripped pancreatic ducts are not adapted to direct implantation into the intestines, therefore the operation proposed by Desjardin is a failure, as indicated by experiments on the six dogs, in which direct implantation of the stripped pancreatic duct was done, after Desjardin's technique. In every instance the duct is sloughed, and in only one case was there even a fistula connecting the duct with the intestine, twenty-five days after operation. The other five cases had died of fat necrosis and peritonitis, resulting from complete obliteration of the connecting duct.

It seems quite probable that the pancreatic duct does not carry sufficient blood supply to maintain its nutrition. On the other hand, we were able to develop a technique by which we could make a perfect implantation of the cut end of the pancreas itself, into the intestine, which was done by throwing two parallel limbs of an intestinal loop into one, by a method similar to Finney's gastroduodenostomy, and leaving the combined lumen of the two limbs open at the apex of the loop. After this double intestine is inverted so as to make a peritoneal channel, the cut end of the pancreas is drawn into this peritoneal canal and sewed in place with fine linen or silk. The union between the pancreas and intestine was primary and perfect in all cases.

In other experiments we found: (1) That if the tail of the pancreas is cut off, and the cut end of the pancreas with the open duct is implanted into a loop of intestine, the cut end of the pancreas heals over, and the duct also is closed

by a firm film, the pancreatic fluid always flowing through the normal outlet, no pancreatitis follows. (2) If the tail of the pancreas is planted in the same way, and the ducts of Santorini and Wirsung are ligated with linen, the pancreatic fluid is delivered backward into the intestinal loop for a few days, but by the end of ten days the pancreatic delivery ducts are reëstablished around the ligatures, and the pancreatic juice is found flowing through its normal openings. At the end of twenty days the duct of the implanted tail had healed over. No pancreatitis followed. (3) When the implantation was accompanied by a doubly ligating and severing of both ends of the delivery ducts of the pancreas, and the two ends separated by a piece of omentum drawn between them, the implanted duct remained open and delivered the pancreatic fluid backward through the implanted tail into the intestine. No pancreatitis existed in these cases.

In other cases we were able to successfully remove the head of the pancreas and implant the cut end of the pancreas into the intestine, with good results in all cases in which dogs survived the shock of the operation, and without pancreatitis, except in one case. If both ducts are ligated and no provision is made for the temporary delivery of the pancreatic fluid, an acute pancreatitis with fat necrosis is established in a considerable number of cases, particularly so if the operation is done during active digestion. If the duct of Wirsung alone is ligated, and if the dog is not actively digesting at the time of the operation, very little disturbance is noticed, inasmuch as the duct of Santorini seems to take up the fluid, but in a few days the duct of Wirsung is reëstablished around the ligature and the dog is in perfect health.

Later work showed that we could sever the pancreas, or crush it completely in its continuity, and that its ducts were restored, provided ample drainage was used temporarily to deliver the pancreatic juice to the surface.

Therefore we approach the threshhold of clinical surgery of the pancreas with the following principles, indicated by experimental work.

1. Peritoneum must be brought to the field of operation in all direct pancreatic surgery.

2. Fat necrosis can only occur when the pancreatic fluid is delivered directly into the extraperitoneal fat.

3. Pancreatic fluid is no more dangerous than bile to the peritoneum, provided ample drainage is used to deliver it to the surface at once.

4. The pancreatic duct seems to depend upon contiguous pancreatic tissue for its nutrition, and therefore is not adapted to direct implantation into the intestine.

5. The cut end of the pancreas, carrying an open duct, may be implanted into a loop of intestine with the same assurance that an intestinal anastomosis is made.

6. There is a marked tendency of the pancreatic ducts to reëstablish continuity around a gap or an obstacle, provided the pancreatic fluid is temporarily delivered to the surface.

7. If the head of the pancreas is removed, and the open end is brought to the surface, a pancreatic fistula results, which usually closes in a few weeks. The secreting portion of the gland is rapidly destroyed, leaving a fibrous cord which contains many islands of Langerhans. A dog lives indefinitely in good health, but for a time has fatty stools.

These propositions are substantiated by clinical developments, before and since the publication of this article in 1908, for we find that Finney and others have resected the middle of the pancreas for solid tumor, with good results. The drainage ceases in a short time after operation. W. J. Mayo has doubly ligated the pancreas in its middle, for hemorrhage, with no evil results, and has frequently shaved a considerable portion of the head of the pancreas, in operations for carcinoma of the stomach, as has the writer also. Bloodgood and others have removed the head of the pancreas

for carcinoma, and have drawn the end out through the abdominal wound. In Bloodgood's case the patient lived six months, and died of recurrence of the cancer in the liver. The remaining portion of the pancreas showed nothing but a fibrous cord, containing many islands of Langerhans, just as we found experimentally. Korte and others have freely split the pancreas and drained it, for acute pancreatitis, stopping the fat necrosis in many instances. The writer also has had two such cases. Cysts of the pancreas have been repeatedly drained by various surgeons, in some cases with, and others without attachment to the parietal peritoneum. In these cases drainage was established by a large gauze pack. Miculicz reported numerous cases of traumatic rupture of the pancreas, as have also other surgeons, including one case by the writer, in which the patient made a complete recovery, by opening the peritoneum and packing gauze around the ruptured pancreas. Pancreatic stones have been several times removed, by direct incision through the pancreatic substance. In some cases the pancreas has been sewed over and in others not, extensive drainage being used in either case. In other words, a stone in the pancreatic duct is treated exactly as a stone in the common duct.

In summing up the literature of clinical accomplishments, we find that the principles which have been proved successful clinically, are in almost exact accord with those brought out in our own experimental work. We therefore fell justified in stating that the only principle which we set forth, as a result of our experimental work, that has not been demonstrated to be true clinically, is that of pancreatoenterostomy, and we feel sure this will be proved true as soon as it has been attempted sufficiently often to give evidence. Surgery of the pancreas therefore seems to be on about as sound a basis as that of any other organ.

DISCUSSION

Dr. Charles H. Mayo, of Rochester, Minnesota.—We all recognize Dr. Coffey's wonderful industry. I do not think he need worry about anyone reproducing these experiments and bringing them out as really new work. It can only be corroborated with advantage by those men who are able to follow Dr. Coffey in this work. It offers a very fruitful field for the young man who is ambitious and anxious to do experimental work. The drainage principle of bringing in the duct of the liver and ureter is exactly on the line that Nature has delivered them. In this way, the ureter in passing into the bladder runs five-eighths of an inch between the mucosa and muscularis and the internal pressure will close it against back flow, except that the least contraction of the ureter against this quantity of fluid in the bladder will keep pumping it into the latter.

In looking up the question of extirpation of the bladder there are a number of cases in the female reported of the removal, with transplantation of the ureters. I find that an enormous amount of work along this line has been done by the Russians and Poles. They have followed out the principle of the old Witzel type which Stiles has advocated. I have usually followed the principle of Dr. Coffey, *i. e.*, incising the peritoneum to get a little more incorporation of the tube into the intestine, apparently reducing its lumen but little.

As to the work on the pancreas, we cannot do very much surgery for the real pancreatic diseases except the cysts, and tumors of the tail and middle as reported by Dr. Finney. Nature has been kind to us in giving a large factor of safety in all the ducts and ductless glands, so that a small percentage of pancreas will carry on perfect digestion.

Dr. Coffey emphasized the point that in injury of the pancreas we should provide for temporary drainage. In these large hemorrhagic conditions, with fatty necrosis, patients are very sick, as a rule, and we cannot carry out as much surgery as we should like. In gunshot wounds and stabs, where the patient has been up to that time in good condition, or where there is a tumor in the tail of the pancreas, and we can work about it without congestion and the troubles incident to inflammatory disease, we can carry out the principles enunciated by Dr. Coffey.

Dr. Thomas S. Cullen, of Baltimore, Maryland.—I have been greatly interested in Dr. Coffey's work. He brought out one point of particular interest to me when he spoke of the escape of pancreatic fluid into the retroperitoneal space, and that all retroperitoneal fat in all parts of the abdomen could be invaded.

While reviewing the literature on diseases of the umbilicus I have been impressed with the fact that fluid can pass extraperitoneally from all parts of the abdomen out through the umbilicus. Take, for instance, broad ligament infections where large abscesses have developed and worked their way extraperitoneally upward and outward to the umbilicus. Accumulations in the chest have perforated the diaphragm and opened out through the umbilicus. If one remembers the anatomical relations a good many hazy conditions are readily accounted for.

I would like to ask Dr. Coffey what his experience has been with pancreatic cysts associated with gall-bladder disease.

Last year I operated on a patient with putty-like gall-stones. The woman recovered promptly, but about a month later complained of abdominal pain chiefly in the epigastric region and back. Within three months of the time she was operated on she developed a large pancreatic cyst.

Dr. Finney said he knew very little about the enlargement of the pancreas associated with some cases of gall-bladder inflammation. I would like to know what light Dr. Coffey can throw on this subject.

Dr. Mack Rogers, of Birmingham, Alabama.—Dr. Coffey's allusion to retroperitoneal infiltration by pancreatic fluid in wounds of that organ, resulting in fat necrosis and death, reminds me of an experience I had several years ago.

One of my colleagues in hospital work, in discussing this subject, called my attention to the fact that every time he found the pancreas wounded he lost his patient; this did not conform to my own experience. This occurred in the days when to drain or not to drain, in all clean cases, was the question.

He had more faith in his technique than I had in mine, so he rarely drained; I did so frequently.

In a short time after this discussion I had a wound of the pancreas that indicated a drain: I did drain, and the patient got well. This gave me renewed courage, and I have drained

all my cases ever since, with good results. These results caused me to conclude that there was something wrong in my colleague's technique, so in a subsequent discussion we agreed that drainage was the thing.

His infiltration had been allowed to take place behind the peritoneum; my wounds had been drained out through the peritoneum; hence the difference in results. We did not realize at that time what Dr. Coffey has so effectually brought out here today, namely, that the peritoneum was responsible for our good results.

But we see now the explanation of it. It is quite clear.

The practical deduction is: Obviate pancreatic infiltration by providing for drainage through the peritoneum.

I have been very much instructed by Dr. Coffey's paper, and personally feel under many obligations to him for it.

Dr. Coffey (closing the discussion).—Dr. Cullen has asked whether I would close a rent in the pancreas as much as possible. If we raise the pancreas and get gauze in behind so that it will drain behind, then we can close as much of the pancreas as possible. The trouble with most of these cases has been they have been ruptured, and the rupture has taken place retroperitoneally entirely. If it is a rupture across, even though it opens into the peritoneum, a large portion of the pancreatic juice will flow back into the sac. It does no harm particularly except where it gets in contact with fat, and then it splits the fat, according to Opie.

There are different varieties of cysts, and I am inclined to think they are most all obstructive cysts. They are practically all obstructive. A large percentage of them are due to stone in the pancreatic duct or the ampulla of Vater. Another large percentage is probably due to inflammatory or chronic pancreatitis which has developed strong bands of inflammatory tissue in the pancreas, shutting it off above. These cases are likely to keep up a fistula for a long time, but the fistula finally heals. It would be interesting to know as to whether this finally is relieved and whether the duct of Santorini develops enough to carry it along. Where you bring the end of the pancreas to the surface, the secreting structures of the pancreas are destroyed, leaving fibrous cord. Cyst of the pancreas, therefore, is a drainage operation. In a cyst large enough to come to the surface, the best way is to suture it to the abdominal wall. If the cyst is small, and if we can diagnose it early, and

if we cannot bring the cyst to the abdominal wall, we can simply slit it, as we would the commond duct, and put a large amount of drainage down to it and cure it in that way.

Pain is one of the most important symptoms of pancreatic cysts, and this pain is severe before you can find the cyst in its early development. These cysts are drainage operations, and those who dissect them out will find that it is not good surgery.

Dr. Cullen.—What is your experience with pancreatitis associated with gall-bladder disease?

Dr. Coffey.—I think Opie was right on that. If you get a small stone well down in the ampulla of Vater, it is liable to produce acute pancreatitis. According to the work of Körte, 50 per cent. of his cases of acute pancreatitis were associated directly with gall-stones, and a large percentage of the others with cholecystitis. But Opie has brought out the best point in regard to the question of Dr. Cullen, that if the gall-stone is large enough to shut up the pancreatic duct you will have chronic pancreatitis. If it is small, so that the ducts are open below the stone, it forces bile back into the pancreas and in these cases acute pancreatitis is produced. There is a very close relation.

As to chronic pancreatitis, like Dr. Finney, I have not been able to find as many of these cases as some others have. I am not able to discover chronic pancreatitis as frequently as Deaver has reported. I have not had experience enough with the head of the pancreas to tell when it is actually inflamed, but I have found relatively few of these cases that I could detect as pancreatitis. There is undoubtedly a very direct relation between pancreatitis and gall-bladder disease.

PYLORIC STENOSIS IN INFANTS

By James F. Mitchell, M.D.
Washington, D. C.

It would on first thought seem that an apology is due for the introduction of such a well worn subject; but the perusal of recent literature convinces one that there is still a certain lack of agreement between clinicians and surgeons as to whether medical or surgical treatment is indicated, and among surgeons themselves some dispute as to the appropriate type of operation in those cases which are so fortunate as to fall into surgical hands. Recent literature also offers interesting data of distinct diagnostic and pathologic value in the development of radiography by means of the bismuth meal before and after operation.

Since first brought to the attention of the medical world by Hirschsprung in 1888, reports of cases have multiplied, and the literature is now voluminous. In this country, the splendid work of Scudder, Stillman, Richter, and others has done much to disseminate knowledge of the subject and excite interest in it; and yet, as Scudder states, there is no doubt that many cases escape detection and go down in vital statistics under such headings as inanition, chronic gastritis, gastro-intestinal catarrh, etc. Autopsy reports and operation protocols are uniform in their description of a pyloric tumor which is always present, hard and free from adhesions to surrounding parts. The whole pyloric stem is thickened and in cases of long standing the stomach may be dilated and its walls hypertrophied. On section

the pyloric thickening is found to be due almost entirely to an enormous development of the circular muscle fibers, an increase in both size and number. The lumen varies, but in marked cases with difficulty admits the finest probe.

The etiology is purely speculative, the two leading views being: (1) That it is a congenital anomaly which progresses after birth, and (2) that there is some primary irritation with consequent spasm and hypertrophy. Kaupe, in 1909, after a careful study of 346 articles bearing on this point, concluded that the etiology was still a mystery.

The clinical picture is well established, and so characteristic that, having seen one typical example, a second is not likely to be overlooked. The diagnosis in my second case was made by the Sister who had observed the first in its hospital course. Nearly all are described as having been healthy at birth; 80 per cent. boys and the majority first-born and breast-fed, though Rammstedt has recently reported an operated case which was the third child in one family to have the same condition.

Vomiting rarely dates from birth, beginning usually between the second and fourth weeks, being then persistent and projectile. In my second and third cases the vomitus was thrown a distance of several feet. Bile is usually absent from the expelled material, and the chemical examination of the stomach contents shows nothing. Constipation is marked and the urine scant. Loss of weight is rapid, and the child, though starved-looking and wizened, is not anemic, and astonishes one by its bright appearance.

On observation the abdomen appears distended above and flattened below. On taking food the characteristic peristaltic waves are seen resembling a ball being rolled from left to right over the region of the stomach. In many cases a hard tumor can be palpated at the site of the pylorus, this observation varying with different reporters from 25 to 75 per cent. I could not definitely feel a pyloric tumor in any of my three cases examined without an anesthetic.

The diagnosis can usually be made on the above signs and symptoms: But it must be remembered that these vary with the degree of stenosis and that in consideration of the treatment, pyloric spasm without stenosis should, if possible, be excluded. The bismuth radiograph is of great assistance in the differential diagnosis. C. G. Mixter reporting the study of several cases of stenosis gives a comparison of the radiographs obtained in this and other gastric conditions in infants. "In gastro-intestinal indigestion the plate taken immediately after the feeding shows the mass well filling the stomach and tapering down to a more or less pointed end at the pylorus with some of the bismuth already in the small intestine. In pylorospasm and stenosis there is a wide departure. There is no sharp differentiation between the two conditions, but the picture produced by pyloric obstruction whether functional or organic is typical. Immediately after ingestion the stomach is shown distended, the bismuth evenly distributed, and the pyloric end of the bismuth outlined in a characteristic prow-like rounded mass. Later bismuth will begin to appear in the intestines, the amount passing the pylorus depending on the degree of obstruction. The bismuth gradually assumes a dense, ball-like mass at the most dependent part of the greater curvature. The pyloric end maintains its prow-like appearance. When the bismuth becomes balled, the exaggerated type of peristalsis is marked in stenosis, while it is absent in pylorospasm." While it may be possible to differentiate sharply extreme grades of spasm or stenosis, there are undoubtedly combinations of the two conditions, and the degree of stenosis also varies, thus making in some cases an accurate diagnosis impossible.

Medical treatment is championed especially by the English and Germans, and operation is resorted to only as a final effort when the baby has become so weakened and emaciated as to make a poor surgical risk, a fact which accounts in large part for the high operative mortality.

Robert Hutchinson probably represents the extreme when he states that surgical treatment is never indicated. His treatment consists essentially in gastric lavage and feeding with small amounts at frequent intervals. The vomiting, he states, is thus soon controlled, but there is no gain in weight and sometimes no progress until the fifth month, when suddenly there comes a change and the child begins to gain a point which Hutchinson calls "rounding the corner." Other pediatricians advise the opposite method of feeding larger amounts at long intervals. Koplik, in a recent article, concludes as follows: "I have practically returned to the first views of Heubner and Pfaundler, and do not submit the vast majority of the cases of hypertrophic stenosis to operation. I regard the prognosis as more favorable under a non-surgical treatment." Surgically various procedures have been used—pylorectomy, divulsion, pyloroplasty, and gastro-enterostomy. It is generally conceded that pylorectomy is too formidable. Divulsion offers evident difficulties. The ordinary pyloroplasty is unsatisfactory because of the unyielding structure of the pylorus and Finney does not consider his operation applicable. In this country posterior gastro-enterostomy has been so universally employed as to be looked upon as the operation of choice. In a recent review of operative methods, however, Rammstedt recommends a modified pyloroplasty. This consists in incising the pylorus longitudinally down to, but not through the mucosa, followed by transverse suture or no suture at all, protecting the incision by wrapping it with omentum. Nicoll has combined this with divulsion through a small incision in the stomach. Rammstedt thinks the skill of the individual operator accounts for the good results obtained by Scudder with posterior gastro-enterostomy, rather inferring that this operation offers peculiar difficulties. My experience does not sustain this view; for except for the small size of the jejunum and the thinness of its walls there is no more technical difficulty

FIG. 1.—Case I. Aged sixteen months. Weight, twenty-two pounds four ounces.

FIG. 2.—Case II. At time of operation, weight five pounds six ounces

FIG. 3.—Case II. Two and one-half years. Weight, thirty pounds.

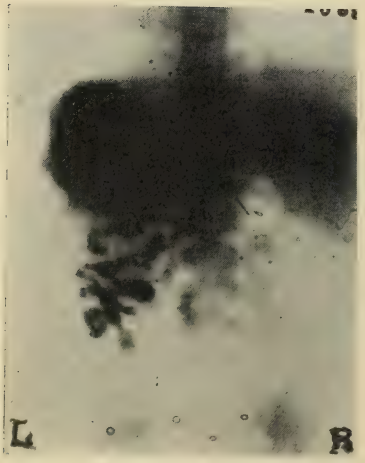

FIG. 4.—Case II. Bismuth *x*-ray, two and one-half years, showing all of bismuth passing through stoma.

FIG. 5.—Case III. Aged eight months. Weight, seventeen and three-quarter pounds.

than in the same procedure in adults. Certainly the consistence of the pyloric tumor does not invite attempts at plastic work upon it. As to the results of either medical or surgical treatment, statistics are, as usual, misleading, for one must consider always the standpoint of the compiler. Thus, from the medical side, Koplik says that "inasmuch as 90 per cent. of many apparently hopeless cases have come through without operation, the risk involved in the operative interference is so great as not to encourage us to place any of these cases in the hands of the surgeon." Hutchinson states that in his private practice, of 17 treated at home, all recovered, while 2 of 3 sent to the hospital died. In hospital work, he had a mortality of 78 per cent. in 64 cases. He gives the combined figures of four reporters in which there were 66 recoveries in 71 cases. His surgical statistics show only 26 recoveries in 51 cases. On the other hand, Scudder, quoting Monnier, says that the estimated mortality from an expectant medical treatment is between 80 and 90 per cent., and that "upon this carefully studied medically-treated postmortem material, much of our present pathologic knowledge of the disease is based. The improvement in Heubner's series of cases and in the cases of others who have thought that they have been treating tumor cases with success, is to be accounted for upon the basis of a mistaken diagnosis, or a temporary and not a permanent cure." There is evidently then some difference of opinion.

The early figures of Scudder on surgical results from 1898 to 1905 show a mortality of 46.5 per cent.; that is, in cases operated upon during the development period of stomach surgery. The selected series of Scudder (17 cases, 3 deaths), Stillman (10 cases, 1 death), and Richter (11 cases, 1 death) gives a mortality of 13 per cent. These were all treated by posterior gastro-enterostomy. In 68 cases collected at random from the literature of 1912 and 1913, operated by various methods in this country and abroad,

I find a mortality of 19 per cent. representing the work of some twenty surgeons. We can only judge from this that under surgical treatment in skilled hands the present mortality is between 10 and 13 per cent., and in general is below 20 per cent. In considering this, it must also be remembered that there were many infants which came to operation *in extremis* after long-continued medical treatment, and that in all of them the diagnosis was established beyond question by the operation; while in any medically-treated series there is an element of uncertainty in the diagnosis and instances of spasm must be included.

As to late results, Stillman's report of the Pacific Coast cases may be taken as a striking example. Of six recovered without operation, one at five years of age was still restricted to semisolid food, a second weighed $7\frac{1}{2}$ pounds at five months, a third $9\frac{3}{4}$ pounds at seven months, and only one was in satisfactory condition, weighing $13\frac{3}{8}$ pounds at six months. The claim has been made that operation would establish an unnatural condition and that digestion would not be normal. Time has well proved the falsity of this prediction for the babies react quickly, gain rapidly, digest normally, and develop as ordinary children.

Radiography with the aid of the bismuth meal has established the fact that the pylorus remains closed years after operation. In view of these facts it must be claimed that pyloric stenosis in infants is a truly surgical disease, that operation is indicated as soon as the diagnosis is established, and that too in suspected cases losing ground under medical treatment, operation should not, as is so often the case, be postponed until the baby has become too weak to "round the corner."

My own experience has been limited to three cases. All came early to operation, only one having reached any degree of emaciation, weighing 5 pounds 6 ounces, a loss of over 3 pounds since birth. Two were operated at seven weeks and the third at six weeks of age; a posterior gastro-

enterostomy being done in each instance. The pylorus always presented the typical stony hard, olive-shaped tumor, with apparently total occlusion of the lumen. They are now healthy, normally-developing children—three and a half years, two and a half years, and eight months after operation. I have been able to secure a radiograph of the case which shows, after two and a half years, that bismuth is leaving the stomach only through the stoma and none by way of the pylorus.

Case I.—A. P., male. Seen on July 6, 1910, with Dr. Bowen. The baby was five weeks old; the third child, the first two being girls. Weight at birth was 7 pounds 4 ounces. He has been breast fed entirely and gained in weight until three days ago. When he was ten days old his mother noticed he was spitting up some milk immediately after nursing, and since this time he has continued to spit up some milk after each nursing, but has gained in weight steadily until three days ago. His weight at one month was 9 pounds 8 ounces. During the last three days the vomiting has increased until he seemed to get rid of the whole feeding, and for the past twenty-four hours the vomiting has been almost constant, and no milk has been retained. He has lost weight. The stools have been normal until this time. There has been no temperature. On examination the baby is bright and healthy looking. The abdominal picture is striking. The upper abdomen, especially the left quadrant, is distended; while the lower abdomen on both sides is distinctly retracted. No mass can be made out in any part of the abdomen, but in the upper left quadrant a definite globular structure can be rolled beneath the fingers, suggesting a distended stomach. On watching the abdomen for some minutes a peristaltic wave can be seen beginning under the left costal margin and passing over toward the liver. This is accompanied by projectile vomiting. A diagnosis of pyloric stenosis was made and operation advised, but was refused by the parents.

July 23. Various methods of feeding have been tried in the past two weeks with no improvement, and progressive loss of weight. The parents have consented to operation.

July 23. Operation. Ether. Incision was made in the median line, below the navel. A greatly dilated stomach presented. The pylorus was found to be represented by an olive-shaped tumor 2 x 2½ cm. It had a sort of translucent appearance, with a suggestion of green, and projected distinctly beyond the stomach and duodenum. It was hard and cartilaginous feeling, and no suggestion of a lumen could be made out because of its incompressibility. A posterior, no-loop gastro-enterostomy was done with the aid of two clamps. This presented no especial difficulty except the small size of the intestine. The abdomen was closed.

For the first few days there was some vomiting, which was relieved by stomach washing. He made a good recovery. He has progressed steadily since operation, his weight at two months being 10 pounds 6 ounces; at seven months, 16 pounds; at sixteen months, 22 pounds 4 ounces; and at the present time, three years and six months of age, his weight is somewhat heavier.

Case II.—P. D., male. Born April 12, 1911. He was the seventh child and his mother died of infection at the time of his birth. His weight at birth was 8 pounds 8 ounces. He took his food well during the first week, but lost 4 ounces, regurgitating part of each feeding. During the second week the vomiting became more pronounced and loss in weight continuous. Food was retained for an hour or so and then ejected with great force, being thrown a distance of several feet. At other times vomiting occurred immediately after feeding. Sometimes two or three feedings would be retained, and then the whole amount expelled, the amount ejected appearing greater than the amount taken in. He was always hungry and never refused food. The stools and urine were both scant. Pyloric stenosis was suggested by the Sister in charge of the ward.

May 28. The baby was examined for the first time. He is bright, but extremely emaciated, weighing 5 pounds 6 ounces. The upper abdomen is distended, the lower retracted. On taking food a wave of peristalsis running from left to right, resembling a ball, can be distinctly seen in the region of the stomach. No tumor can be palpated. A diagnosis of pyloric stenosis was made.

Operation. June 1. Ether. Median incision. The stomach was enlarged. The pylorus was represented by a hard, whitish, olive-shaped tumor about $1\frac{1}{2}$ x $2\frac{1}{2}$ cm. The pylorus was stony hard and seemed completely obstructed. Posterior, no-loop gastro-enterostomy was done with the aid of clamps. The operation was not difficult except for the great thinness of the small intestine. The abdomen was closed.

The baby was not shocked by the operation. He did not vomit after the operation and feeding was started almost immediately. He gained 8 ounces in weight in the first six days. On July 11, six weeks after the operation, his weight was 9 pounds. Since this time the boy has progressed steadily, and although living in poor surroundings, without medical care or supervision, he is now, at the age of two years and eight months, in excellent health and weighs 30 pounds.

Case III.—M. L. B., male; born March 8, 1913; the fourth child; healthy. At birth he weighed 7 pounds 12 ounces. He was breast fed and flourished until three and a half weeks of age, when he weighed 9 pounds. He then vomited for the first time in life, without assignable cause (April 1, 1913). His vomiting continued from this time, and by April 10 the bowel movements had become reduced to a little green mucus. On April 11 his weight had been reduced to 8 pounds and the vomiting had become projectile. On April 18 he was seen by Dr. Donally, having been brought to him from his home in North Carolina. His weight then was 7 pounds 12 ounces. The upper abdomen

was fuller than the lower, and after taking food a mass could be seen in the left epigastrium about the size of a ping-pong ball, which rolled down and toward the right. A doubtful tumor was felt in the right epigastrium. A diagnosis of pyloric stenosis was made by Dr. Donally and he was referred to me for operation.

Operation. April 21. Ether. Median incision. The stomach appeared slightly distended. The pylorus was represented by a stony hard, olive-shaped, grayish-colored tumor about 22 cm. long, projecting distinctly from the level of the stomach. It was incompressible and apparently completely obstructed. A posterior, no loop gastro-enterostomy was done with the aid of a clamp on the stomach side only, the intestine being so small and collapsed that no clamp was used. The child stood the operation well and was not shocked.

His progress after operation was steady, and he immediately began to gain in weight. On August 15, at five months of age, his mother writes that the baby is in splendid condition and weighs 15 pounds 5 ounces. On November 18, at eight months, he weighed 17 pounds 10 ounces and was in splendid health.

DISCUSSION

Dr. Charles Mixter, Jr., of Boston, Massachusetts.—I am very grateful for the opportunity of hearing Dr. Mitchell's interesting paper, as it is a subject of particular interest to me. His excellent results, I think, are worthy of observation, because this is a condition in which the low power of resistance of the baby is well known and the technical difficulties are considerable.

Last spring I read a paper before the New England Pediatric Association on "Congenital Pyloric Stenosis," in infants admitted to our service at the Children's Hospital. I was particularly interested in the *x*-ray study of the cases before and after operation to determine the value of the *x*-ray as a diagnostic procedure and to ascertain, if possible, the role

played by spasm, superimposed on the fundamental hypertrophic lesion in these cases. The diagnosis of a pyloric obstruction is readily made from the *x*-rays and rules out conclusively the different forms of gastro-intestinal indigestion so often mistaken for this condition; but the differential diagnosis between pylorospasm and hypertrophic stenosis is much more difficult. In spasm there is absence of the exaggerated type of peristalsis seen in true stenosis, and the balling of the bismuth meal takes place much less rapidly, and after a certain period of time, generally hastened by a second meal (counting the bismuth meal as an ordinary feeding), the bismuth will be seen passing through the relaxed pylorus. That spasm plays a negligible part I think I can show you from the *x*-rays in cases of true stenosis.

The picture on the left shows a series of *x*-rays in a case of gastro-intestinal indigestion. The stomach shows on the left of the plate. There is no departure from the normal infant's stomach at the same age in this condition. The first picture was taken immediately after a bismuth meal, and the second picture was taken two hours after the bismuth meal was given. It shows how slowly the normal infant's stomach empties.

This is a case of pylorospasm, the bismuth showing in the upper slide, which was taken at once after the meal was given, filling the stomach completely. There is a balling of the bismuth, mass which is shown in the next two slides, but it is not as marked as in true stenosis. You will see there is no exaggerated peristalsis.

This is a case of hypertrophic stenosis. The bismuth can be seen clinging to the stomach-wall and showing a prow-like end of the stomach. It does not go down to a point at the pylorus, and as the time increases there is a tendency toward balling in these cases. The lower left-hand picture shows it. The one on the right shows very well the shape of the stomach in these cases, the lower right being the pylorus. The upper picture on the left was taken twenty minutes after the bismuth meal. It shows a rounded end of the stomach an hour and ten minutes after the meal was given and the bismuth had started to ball. These pictures were taken three and four hours respectively after the meal, showing no bismuth in the small intestine. The slides were taken after operation. I took this series six days after the gastro-enterostomy was done. It shows all the bismuth passing out through the stoma except

for a faint trickle through the pylorus, but the bismuth meal is rounded at the pyloric end. The rapidity with which it empties is shown by the plates being taken ten minutes after, twenty minutes after, and three-quarters of an hour after the bismuth meal.

These are more cases showing the bismuth passing through the stoma into the small intestine. They do not differ from the first cases except in the length of time after operation. Here is another which was taken six months after operation, and still another taken nine months after operation. It shows the bismuth passing rapidly through the gastro-enterostomy opening to the small intestine.

These upper two slides were taken three and one-half years after operation, and the child was so old I had to give the bismuth by mouth, instead of through a tube, which accounts for the bismuth being in the intestine, although the picture was taken as soon as possible after the meal was given. The lower slide is interesting. An attempt was made to pass a duodenal catheter, the catheter entered the stomach, traversed the greater curvature, was deflected upward to the pylorus, made a circuit of the stomach and came out through the stoma. The attempt was made by a gentleman who believed the pylorus had relaxed with age. He was an advocate of the medical treatment in these cases, but his attempt to reach the duodenum through the pylorus was not successful.

Dr. R. C. Coffey, of Portland, Oregon.—We have the experience and confidence of two internists and one pediatrist in our city, and they are more enthusiastic over surgery in these cases of pyloric stenosis than we are, because they often find a great difference, and if they do not get around pretty fast, the surgeons will get the cases. Our pediatrist, Dr. Bilderback, does not treat these cases of pyloric stenosis a single day after he recognizes the diagnosis is correct, because he has found the results are so much better from operation than from medical treatment, as has been pointed out here both by Dr. Mitchell and Dr. Mixter. If we can eliminate those internists who say they cure 90 per cent. of the cases medically, and can get these cases into our hands early, I do not see any reason why the mortality in infants should be greater than in adults from operation. The shock is nothing, and the operation is no more difficult; it is done more quickly than in the adult. Our results in these cases have been just

as good and just as free from danger as those reported. In the future, if the diagnosis is made early, as determined by the *x*-ray, and these cases are operated promptly, the mortality will be very materially lessened, because the death rate as reported now is in cases which have gone beyond hope practically.

Dr. Mitchell (closing the discussion).—I have very little more to say except to thank the gentlemen for their cordial discussion. I really believe with Dr. Scudder that many of these cases pass unnoticed, and I think it is our duty to keep drumming this thing up, so that these babies may come to surgical treatment before it is too late to do anything for for them.

I have made an attempt to collect the cases, but it is absolutely impossible to do so, for the reason that all men do not report their results. Dr. Dean Lewis, of Chicago, has had four successful cases; other men have lost cases, and do not consider it worth while to report them, so that the statistics are not of as much value as they might be. I think we should impress upon medical men and upon pediatrists just what Dr. Coffey has done, namely, that these cases are truly surgical, and the chance for their recovery depends upon getting them to the surgeon early.

EXCISION OF THE CLAVICLE AND FIRST RIB FOR MALIGNANT DISEASE

By R. E. Fort, M.D.
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Much doubt exists as to whom should be credited with the honor of first completely excising the clavicle. Treves[1] gives McCreary, of Kentucky, priority, 1811. Gross[2] credits Remmer as the first operator in 1732. Zabel[3] credits Moreau and d'Angerville, of Paris, with the first total excision in 1765, and claims that the operation of Remmer was without doubt a partial not a total extirpation. Heyfelder[4] gives Mayer the credit of the first in 1823 and Cassebohn with the first partial extirpation in 1719, and Coley[5] credits Valentine Mott with the first in 1828.

Without attempting to harmonize this conflict of authorities as to who is entitled to this honor, we were astonished to find reports of only 64 total excisions, 1 excision of the clavicle and sternal ends of the first and second ribs. "Morfitt's Case" reported by Carson,[6] and no reported case of total excision of the clavicle and the first rib.

It is the writer's object to report a case of excision of the clavicle and first rib, but it will not be amiss to notice some of the important facts concerned in the literature of excision of the clavicle. Mott in his report says: "This operation far surpasses in tediousness, difficulty, and danger anything that I have ever witnessed or performed. It is impossible for any description which we are capable of giving to convey an accurate idea of its formidable nature."

Velpeau[7] calls the operation "a daring attempt never carried into effect except in a few cases of operation upon the shoulder;" yet he says, "there are circumstances sufficiently numerous which require this operation if we wish not to abandon the sufferers to certain death." C. Norkes[8] collected 32 cases of excision for malignant tumors, of which 24 were sarcoma, 5 reported as carcinoma, 2 exarthrosis, and 1 chondroma, with 6 deaths. Coley states that the cases reported as carcinoma were probably sarcoma, as primary carcinoma of the clavicle is unknown.

Since 1893 Coley has collected 32 additional cases, making a total of 64.

The immediate mortality of excision of the clavicle is between 16 and 18 per cent., but the end results, or those who die from recurrence, is quite 70 per cent. The results, however, are sufficiently hopeful to make immediate surgical intervention not only justifiable but mandatory.

The types of tumors observed by pathologists have been varied. Periosteal, round cell, periosteal, spindle cell, osteosarcoma, small round cell, spindle cell, myeloid, myelogenous, chondroma, embryonic, myeloid fibrous and fibroplastic, and my own osteosarcoma, giant cell.

Ages of Patients. Two between one and ten years, 20 between ten and twenty, 9 between twenty and thirty, 12 between thirty and forty, 7 between forty and fifty, 1 between fifty and sixty, and 3 between sixty and seventy years.

Diagnosis. A study of the reported cases makes it quite clear that the diagnosis must be made early if there is to be a probability of saving the patient. No variety of tumor is more malignant than a majority of sarcomata of the clavicle. The vascularity of the neck insures early infiltration and rapid generalization. The history of antecedent trauma is important. Seven of the nine cases observed by Coley gave histories of trauma. In most cases the swelling will be noted very soon after the receipt of the injury. In its early stages it is usually hard, smooth, and immovable.

Tuberculosis. Tuberculosis is a condition from which sarcoma must be differentiated. "A history of tuberculosis in the family, or tuberculosis in some other portion of the body would justify us in ruling out sarcoma." (Coley.) It is also to be noted that primary tuberculosis of the clavicle is extremely rare, and sarcoma is prone to occur in strong and healthy individuals, and more often in the young than in the middle-aged and old.

Syphilis. This is a rare condition in the clavicle, so where no other bone is involved, where the clinical diagnosis is reasonably indicative of sarcoma, especially where the tumor has appeared in a young person showing rapid growth, excision should be done without excising a portion of the tumor for microscopic examination, thereby giving the opportunity for localized infection. It is usually impossible to make a satisfactory frozen section for the reason that decalcification must first be made. We would advise total extirpation, as partial extirpation of any bone for sarcoma is incomplete surgery. Coley, Richardson, and others advise treatment with the mixed toxins of erysipelas and Bacillus prodigiosus as a prophylactic against recurrence. Coley claims that it is entirely free from danger, and this has been my observation; but frankness compels me to state that my results from its use in sarcoma in other bones have been disappointing. Bearing in mind, however, the statements of Coley that it is without danger, and that in cases of sarcoma of the long bones generally in which toxins have been used, recurrences have been less than one-third as frequent as in cases in which they have not been used, justification for its use in all cases would seem apparent.

Results after Excision. In 2 cases there was recurrence in four years after operation, in 2 within eighteen months, in 1 case sarcoma of the femur developed three months after operation, in 1 case there was local recurrence within six months, in 1 recurrence was immediate, in 1

A. B., aged eleven years. Three weeks after complete excision of clavicle and first rib.

sarcoma recurred in the upper jaw nine months after operation, in 3 cases recurrence was within three months, in 7 recurrence occurred within six months, 2 were well five years after operation, 1 case well one year, 1 case well seven months, 1 case fifty years, and the case reported below well six months after operation.

A. B., aged eleven years; mother living; father died by violence; no family history of tuberculosis or syphilis. Patient a fairly well developed boy, no Hutchinson's teeth or other evidence of congenital syphilis. Tumor of clavicle was noticed eight months before he presented himself. At five months he was seen by another surgeon, who cut down on the tumor, chiselled it away as best he could, and submitted the specimen to Dr. Wm. Litterer, who reported giant-celled osteosarcoma. The wound healed, but the tumor rapidly reproduced itself, and when he presented himself to us on July 23, 1913, a tumor the size of an English walnut was attached to the inner third of the clavicle and first rib. It was hard, smooth, and firmly attached at its base with no history of trauma.

The diagnosis of malignancy having already been made, we advised its immediate removal. A T-shaped incision was made from the sternum along the lower border of the clavicle, to the coracoid process of the scapula, and from the upper portion of the sternum to the upper border of the second rib. The skin over the tumor was removed by an elliptical incision, and realizing the danger of division of the clavicle, disarticulation was made from the sternum and first rib, the cervical fascia and sternomastoid muscle incised well above the tumor until the middle portion of the clavicle was reached, here the trapezius muscle was separated from its clavicular attachments close to the bone. The same method was used below. The clavicle was lifted from its sternal end and separated from the mediastinum, the pleura, the subclavian vessels and liga-

ments by gauze and scissor dissection. The rib was now disarticulated from the sternum, separating it from the scalenus medius and intercostal muscles, the mediastinum and the pleura by blunt dissection, the close proximity of the subclavian vessels passing through the subclavian grooves of the first rib was the most tedious part of the procedure. A small abdominal retractor was padded with gauze and the vessels held up by an assistant during the removal of the outer part of the rib. The dissection completed to its vertebral attachment, some difficulty was encountered in disarticulation; finally this was accomplished by inserting blunt scissors into the articulation and severing the ligament. The tumor was sufficiently close to the sternum for me to indulge in the fear that this bone had become infected. Consequently we removed about one-half of the sternum from its upper portion to upper portion of the second rib. The safety of this procedure was, I think, guaranteed by the separation of the mediastinum from the posterior surface of the sternum and its protection with gauze. I can conceive no more important step of this operation than the protection of the pleura and mediastinum from wound, as a large percentage of immediate fatalities have been caused by infection of these cavities. The wound was closed by approximating the cervical fascia, the sternomastoid and the trapezius muscles above and the deltoid and fibers of the pectoralis major muscles below. The skin was closed and approximation of the internal half of the skin was secured by a flap from below. A cigarette drain was inserted at the middle portion of the wound, no vessel was tied throughout the operation. Time of operation, one hour and forty-five minutes. There was no injury to either the mediastinum or the pleura, consequently there was no infection. The patient sat up on the fourth day, and made an uninterrupted recovery, leaving the hospital on August 18, having gained ten pounds in weight. After

ten days the use of the left arm was encouraged. The two features which impressed us most were the free use of the arm, and the absence of deformity of the left chest. In the absence of the scar it would be hard to detect the side upon which the excisions had been done. Toxins of erysipelas and Bacillus prodigiosus were given in increasing doses until the dose was established, and this dose was persisted in for two months after operation.

A letter received from his uncle, Dr. J. D. Bryant, of Fayetteville, Tennessee, dated December 3, reports that he is going to school, growing, and has no evidence of recurrence. He also reports that he shucks corn, harnesses the horses, hauls wood with his goat and wagon, in fact, he can see no deficiency in the left shoulder.

Conclusions. 1. Primary sarcoma of the clavicle is a rare condition, and the earlier the diagnosis and the more radical the treatment, the better the chances for complete recovery.

2. The writer is of the opinion that partial excision of the clavicle or first rib should not be practiced for malignant disease.

3. The danger of local or general metastases is very great, and as division of the bone increases this hazard, excision should be made with the bone intact.

4. Because of the favorable results obtained in the few cases of sarcomata of the clavicle and the larger number of sarcomata of the long bones, it is advisable to use the mixed toxins of erysipelas and Bacillus prodigiosus for two or three months after operation.

5. Under modern aseptic conditions the mortality for excision of the clavicle and excision of the first rib should be comparitively small, and considering the fate of the patients who are denied surgery, the opportunity of relief by surgery is mandatory.

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DISCUSSION

Dr. Samuel J. Mixter, of Boston, Massachusetts.—I think Dr. Fort should be congratulated on the result in this case, because excision of the rib adds so materially to the severity of the operation or to the danger of the operation. Excision of the clavicle itself, if the tumor is not large and infiltrated, is comparatively easy. I have only had one case of sarcoma of the clavicle, which I reported many years ago, and the man is still alive. That was before the days of the Coley treatment, and he had no subsequent treatment. It was one of those cases of giant-cell sarcoma, which was not very malignant, and today perhaps one would not have excised the whole clavicle. As Dr. Fort has said, one striking thing about the after-result is the slight deformity. There is no dropping of the shoulder; there is no weakness of the limb, and the patient is just as well off without the clavicle as with it, and with clothes on it shows absolutely no deformity. There is such a difference in the nature of the disease. I saw a few weeks ago a man who, just about six weeks before he died, had a sarcoma of the clavicle that had infiltrated the neck rapidly, and he was already getting small nodules in the scalp, skin, and other parts of the body. Operation was absolutely impossible. It was a case of rapidly growing malignant form of sarcoma very different from the first one that I mentioned.

Dr. V. P. Blair, of St. Louis, Missouri.—The removal of the clavicle naturally suggests some thought as to its function. The shoulder girdle in man stands half way between that of the quadruped, which is entirely supported by muscles, and that of the bird, which is fixed almost as firmly as is the pelvis of other animals.

The breadth of the human shoulders is not dependent upon the clavicle but upon the great lateral expansion of the thorax as compared to other animals. The scapulæ are balanced upon the outer borders of the thorax by the attached muscles, and after one clavicle is removed or both are naturally absent, the breadth of the shoulders still remains about average. We have observed two cases of congenital rudimentary or absent clavicles and two of removal of the clavicle. As far as can be determined, the function of the scapula in man is to compensate for the extreme shallowness and narrowness of the glenoid fossa of the scapula as compared with the size of the head of the humerus, which gives the extremely free movement at the shoulder which man enjoys.

The clavicle compensates for the resulting weakness of this joint by enabling the muscles to keep the small glenoid fossa directly apposed, the axis of force applied through the shaft of the humerus, thus usually preventing dislocation; when too great force is suddenly applied the clavicle may fracture.

Dr. George Tully Vaughan, of Washington, D. C.—I wish to congratulate Dr. Fort on the successful operation which he performed in this case. Undoubtedly, as Dr. Mixter has said excision of the first rib increases very much the difficulty of the operation. It is the most difficult part of it.

My experience with excision of the clavicle is limited to two cases, in one of which the entire clavicle was removed, and in the other about two-thirds of it was removed for osteomyelitis. In the latter I resorted to subperiosteal resection, and the clavicle was restored afterward. In the other case, which I think is of considerable interest as showing how long a patient may be free from sarcoma, the operation was done seventeen years ago in Philadelphia, on a sailor whose business it was to shovel coal. He had a sarcoma of the right clavicle. Complete resection or excision was done. As the gentlemen have stated, there was no deformity, as was shown by pictures taken afterward. I heard from that patient at intervals until last year. Last year he was in the Tuberculosis Hospital of the United States public health service at Fort Stanton, New Mexico. It may be thought that the original disease was tuberculosis, and that this was simply a recurrence in the lung. It may have been also a recurrence of sarcoma. The specimen was examined by a competent pathologist at the time, who pronounced it a mixed round-cell sarcoma. If we

admit that he has a recurrence now in the lung, it does not disprove the fact that he had a sarcoma of the clavicle sixteen or seventeen years ago. If it was tuberculosis at that time, which it could not have been in my judgment, there was a long interval of rest. The deformity amounts to nothing. The trapezius and sternomastoid muscles above were sewed to the deltoid and pectoral below, and the patient had perfect use of the arm afterward. He resumed his occupation and remained at it for many years.

Dr. William L. Rodman, of Philadelphia, Pennsylvania.—I wish to add my congratulations to what has already been said with regard to this most interesting case, and what I consider a remarkably brilliant result, because, as has been said by two of the previous speakers, excision of the first rib was the more difficult part of the procedure. I have never myself done excision of the clavicle unless the scapula and arm were removed at the same time. I did that once successfully.

What is really of great interest to me at this time is the historical fact which has been referred to today. I, a loyal Kentuckian, believe that MacCreary is entitled to the credit for having first performed total excision of the clavicle. Not only do we believe that McDowell is entitled to credit as the father of ovariotomy, and that Brashear was the first to do a successful hip-joint amputation in the world and the very first to do the operation at all in America, but we believe as well that MacCreary was unquestionably the first to perform complete excision of the clavicle. Dr. Fort quotes my friend Coley (who is accurate in his observations and goes to the bottom of things as a general thing) as saying that the excision of the clavicle performed by Valentine Mott was a complete one; I am quite sure it was not. It was an incomplete excision and, moreover, done more than a decade after the operation of MacCreary. Many have been impressed with the fact that Mott's operation was a more formidable procedure than it was because he called it his "Waterloo operation," it having been done on the anniversary of the battle of Waterloo. I know that the elder Gross, in an address given before the Kentucky State Medical Association in 1845, gave the credit to MacCreary for the first total excision of the clavicle, just as he later in 1879 vindicated beyond the peradventure of a doubt, the claims of Ephraim McDowell as the father of ovariotomy. Up to that time, but not since, it was disputed.

I did not hear very distinctly what Dr. Fort said as to the operation which had been done by a Frenchman in the eighteenth century. I wish he would speak more fully on that point.

I am quite sure the operation of Mott was not a complete excision from the statements of many who have reviewed the literature.

Dr. Fort (closing the discussion).—Like Dr. Rodman, I was of the opinion that the priority of MacCreary's operation was undisputed, but I thought Dr. Coley would be here, and was afraid that he would present some undisputable evidence that Valentine Mott's case was a total excision. Mott's reference to his case as his "Waterloo operation" as an historical fact had not come to me before, and I wish to thank Dr. Rodman for it. Whether it was partial or total, I assume that it was an extensive operation for advanced sarcoma which required ligation of the subclavian vessels.

Velpeau also speaks of the operation with a good deal of alarm, and advises against it except in extreme cases, but as Dr. Mixter has said, if we get a case early, before the sarcoma has extensively involved the soft tissues, excision of the clavicle itself is not a difficult surgical procedure, but complete excision of the first rib is another question, and one which was exceedingly difficult in my hands.

My reason for reporting this case was that after a reasonably diligent search of the literature, I could find no other reported case of complete excision, and only three of partial excision.

I wish to thank the gentlemen for so liberally discussing the paper.

CONGENITAL TUMORS OF THE NECK

By C. E. Caldwell, M.D.
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It is not my purpose, as might be inferred from the title of this paper, even to attempt a discussion of so vast a subject as is comprised therein.

Rather, it is my intention to dwell in a general way on the subject of congenital tumors, to arrive at some kind of classification based on more recent pathological and anatomical research, and then to attempt the elucidation of a certain class of these tumors from recent and valuable contributions to the embryology of the subject.

If the classification herein attempted does not meet with general approval, I may say in extenuation, that any classification at all, is, in the present uncertain state of our knowledge, liable to modification as from time to time more light is shed on this obscure topic.

In the very nature of things almost any statement as to the histogenesis of these tumors must be accepted with certain reservations. From the histological findings in a given case we can establish its origin at best only inferentially.

It is perhaps inevitable, with such a vast amount of research as has been devoted to this subject, that one should become lost in this veritable Cretean labyrinth, and lose the thread which may lead to safe conclusions.

From the time of the discovery of the branchial clefts in the human fetus by Rathke, in 1827, and the recognition

of its importance by Ascherson in the explanation of congenital fistulæ of the neck, and the later recognition by Roser, in 1864, of its bearing upon the cause of cystic tumors of the neck, up to the present time, and particularly since Virchow lent the weight of his authority to the name of "tumors of the branchial clefts," all tumors of the neck of suspected congenital origin have been loosely comprised under the term "branchiogenic."

More critical study of these tumors, and especially careful histologic examination, has shown that not all congenital tumors of the neck are branchiogenic.

Among those who have contributed in largest measure to the elucidation of this subject, are Roser, Virchow, Lannelongue and Kirmisson, Lücke, Gussenbauer, and more recently Estor and Massabuau, Lecène, Gutmann, E. Zoeppritz, Savelli, and H. E. Lorenz.

As an instance of the vagueness of knowledge regarding the character of these tumors I may cite the opinion of Roser, who about seventy years ago, said that certain ranulas about the base of the tongue were due to imperfect closure of the branchial clefts. As he was ignorant of the existence of the thyroglossal duct, it is not strange that such a statement should have been made. The part which accessory thyroids, and the rest of the thymopharyngeal duct were to play in the etiology of congenital tumors was also at that time unsuspected.

Senn, writing in 1884, says: "The great difficulties which are often encountered in the diagnosis of cervical tumors, and the importance of all the anatomical structures which are involved in all operative procedures for their removal, are well known and appreciated by all who can speak from personal experience. One of the most important, and at the same time one of the darkest chapters treating of tumors in this region, relates to cystic tumors, and more particularly that variety which originates from congenital defects of development, the matrix being composed of fetal epiblastic

or hypoblastic tissue, which remains in its embryonic state for an indefinite time, and later by prolification of its epithelial elements, gives rise to a distinct and characteristic type of cystic tumors." Nowhere perhaps was the greatness of our immortal Senn more evident than in such lucid and comprehensive descriptions. What might he not have contributed to the etiology of these tumors, had he possessed the laboratory aids to diagnosis at the command of the surgeon of today.

Further on he says: "Branchial cysts should be classified according to their contents." If by contents he meant not only free contents, but epithelial investment, this would in a sense be true.

On the other hand, Lannelongue says: "The contents of the cyst possess no absolute value in the interpretation of its pathogenesis."

It would seem that in estimating the probable nature and origin of such tumors, we must be guided first of all by the history, secondly by the location, third by the consistency, fourth by the nature of the contents, and finally by the histological elements predominating in the investment of the cyst wall, the interstitial tissue of the wall itself, and the structures in most immediate relation to it. A cyst of a dermoid character dipping deeply below the normal site of dermal structures is evidently due to dermal rests of some fetal structure whether branchial or other. A cyst containing entodermic cells must obviously have originated where such cells normally exist, while a cyst wall of endothelial cells must have had its origin in some mesoblastic structure, whether mixed, as, for example, from the carotid body, lymphatic, or vascular.

An interpretation of these tumors, therefore, based on histological examination with especial reference in the case of cysts to the character of their epithelial investment, taken together with a careful study of the embryology of the neck as shown in animal and human fetuses, is perhaps

the only logical way to arrive at inferentially accurate conclusions. I use the word inferentially with reason, because due allowance must be made for errors of interpretation due to the inadequacy of conclusive evidence, and to the variance in the individual equation.

Hardly two investigators with the same facts before them will deduce the same conclusions.

Tumors of the neck as regards their location may be divided into median and lateral tumors.

Obviously, the median tumors may be traced to an origin other than from the branchial clefts; in other words, from the thyroglossal duct, or rests of accessory thyroids.

As to those located laterally, we have a choice between four origins—branchial clefts, remains or rests of the thymopharyngeal duct, tumors of lymphatic origin, and from the carotid body.

When originating from the branchial clefts we have the *bona fide* branchial cysts and fistulæ; from the thymopharyngeal duct, we have the so-called branchiogenic carcinoma. When originating from lymphatic structures we have the multilocular serous cyst, vel hygroma, vel hydrocele colli, vel lymphangiomacysticum, from the carotid body, carotid body tumors. The impossibility of dealing with the whole of this subject in a manner which can be productive of any conclusions worth the while, has led me to consider the subject of multilocular serous cysts as perhaps coming within the scope of a paper so limited in the time allotted to it.

That much confusion has existed in the past with regard to this type of tumors, is but evidenced by Senn's paper, written in 1884. He says: "This variety of branchial cysts is composed of thin cyst walls and serous contents, and may develop from any of the branchial clefts which fail to obliterate completely.

"This affection has been described under the name of hydrocele colli (Manoir), congenital hygroma of the neck

(Wernher), and congenital cystic tumor of the neck (Thomas Smith); Mannoir, under the name of hydrocele colli, described certain serous cysts occurring between the angle of the jaw and mastoid process, and between the larynx and the anterior margin of the sternocleidomastoid, a region which corresponds to the second and third branchial clefts, which were supposed not to be congenital."

It is hardly necessary in the light of cumulative evidence today to say how far astray Senn was in his interpretation of this class of cysts. Senn was, however, probably not familiar with all the contemporary literature on this subject, because there had already been numerous contributions both in French and German which should have at least put the branchiogenic origin of these cysts in question.

Caesar Hawkins in 1839, Holmes Coote in 1849, and Cruveillier in 1856, had successively lent their support to the theory of the vascular origin of these cysts, while Wegner in his classification of lymphangiomata gives in his third class: "Cystic lymphangioma, hygroma cysticum colli congenitum, formed by an agglomeration of cysts of variable size."

It is, however, to the studies of Victor Veau and to his pupil Andrè Savelli that we owe the most complete and classic exposition of this whole subject.

I will endeavor to epitomize Savelli's conclusions.

These conclusions are based on the study of Veau's sections, which are reproduced here in charts, which charts you will not fail to compare with those of Florence Sabin, also reproduced. Savelli says: "In a note which M. Victor Veau was kind enough to send me, he says: 'There exists normally in the neck of embryos of from two to three months lymphatic cavities, recalling by their disposition, congenital serous cysts of this region. These cavities are situated external to the sheath of the carotid and jugular. They are in direct contact with the vein, and superficially are covered by the sternocleidomastoid muscle. Behind they

FIG. 1.—S.l.j., jugular lymph sacs. (After Sabin.)

FIG. 2.—Lines 3 and 4 showing levels of sacs as shown in Fig. 3. (After Sabin.)

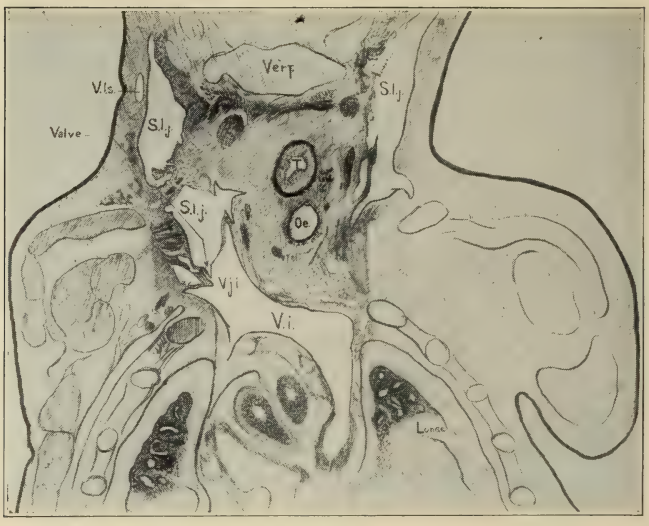

FIG. 3.—S.l.j., jugular lymph sac. (After Sabin.)

FIG. 4.—Showing bridging over of lymph sacs, preparatory to formation of chains of lymph nodes. (After Sabin.)

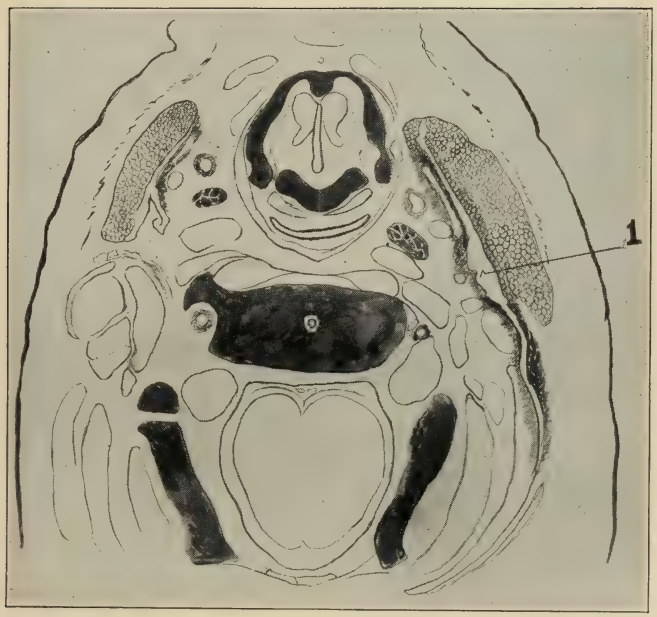

Fig. 5.—1, lymphatic lacunæ. Not recognized as having relation to lymph nodes. (After Victor Veau.)

FIG. 6.—Boy, aged eight years. Multilocular congenital cyst.

FIG. 7.—Rear view showing extension of growth behind ear.

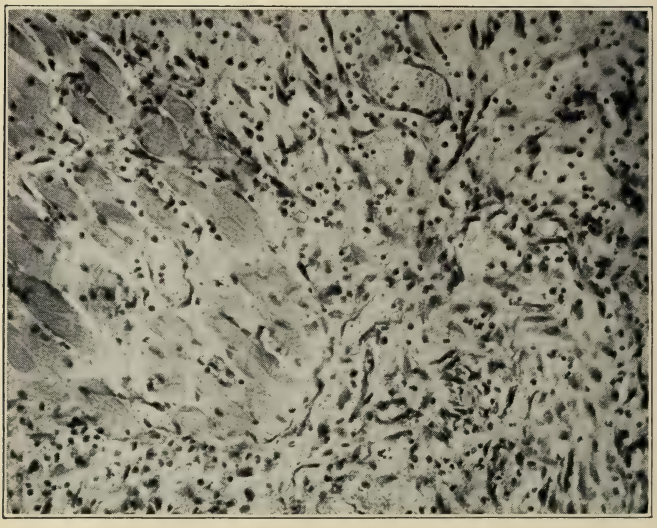

Fig. 8.—Cyst wall. Photomicrograph by Dr. Charles Goosman, showing striped and unstriped muscular fibers.

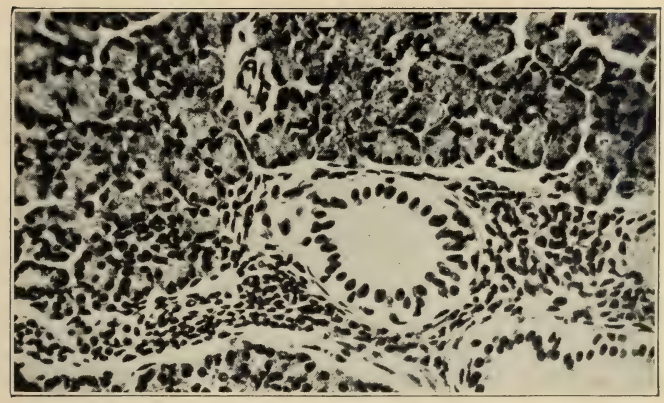

FIG. 9.—Cyst wall. Photomicrograph by Dr. Chalres Goosman, showing parotid tissue covering cyst

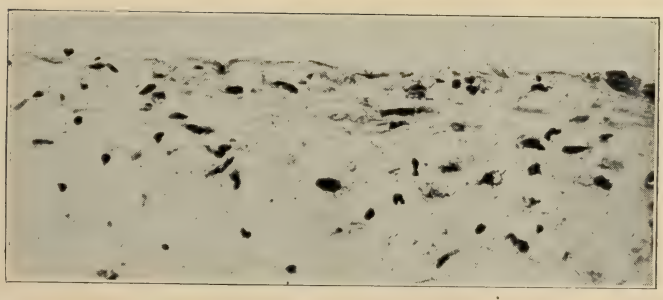

FIG. 10.—Cyst wall. Photomicrograph by Dr. Charles Goosman, showing almost obliterated endothelial lining

extend to the side of the muscles of the neck and often infiltrate into their depths. In front they scarcely reach the median line and above hardly pass above the jaw, while below they reach to the margin of the axilla.' (This latter point is of interest as it represents about the level of junction in the fetus of the primitive ulnar with the jugular, as seen in the charts taken from Miss Sabin's article.)

"Often these cavities open into the jugular vein, and sometimes the orifice is very considerable, at other times very small.

"The wall of the cavities is formed by a single layer of cells of unequal height; these cells are often flat, the large nucleus emerging into the interior of the cavity.

"Sometimes the cells are higher and become cubical, and recall the picture of stratified epithelium. It was this appearance that for a time caused M. Veau to consider these cavities of ectodermic origin. Often there exists in these cavities fringes, more or less pediculated, formed by a mass of cells cubical or flattened."

And here I venture to submit is the most significant statement in support of the theory which I wish to present and which has been more than suggested by Savelli, and is still fruther corroborated by the sections of Miss Sabin.

M. Victor Veau notices that these lymphatic lacunæ appear to bear no relation to the lymph nodes, for at a more advanced period (four or five months) one sees only a mass of leukocytes, future lymph nodes, formed around and outside of these.

It seems strange in the light of Ranvier's demonstrations, and especially in the present light thrown upon the whole subject by the investigations of Miss Sabin, that such an inference should have been drawn by M. Veau from his sections.

If we are to cling to the accepted theory that lymph vessels are derived from tissue clefts, rather than directly from the veins themselves, as Miss Sabin has shown, there

would still be room for the assumption that these same lymph spaces might by arrest and occlusion develop into multilocular cysts, but if it can be shown that the lymph spaces or lymph vessels are directly derived from the veins, as I feel convinced Miss Sabin has shown, then in the bridging over of these lymphatic sacs we have the multilocular cysts in embryo, which have been arrested in the course of their evolution into chains of lymphatic nodes.

Savelli's conclusions, and I wish to say that I read his article after having read Miss Sabin's, from which I derived similar but perhaps more definite ones, are the following:

1. Serous congenital cysts of the neck are lymphangiomata.

2. The pathogenic theory that they are derived from ductless glands (Luschka, Arnold) and the vascular theory, the derivation from angiomata (Broca Cruveillier) should be abandoned.

3. We think that the congenital serous cysts of the neck are due to an arrest of the development of the lymphatic system of the cervical region. This hypothesis is based on what the sections of embryos of different ages have shown us (Victor Veau) and on what we know of the vices of development of the lymphatic system (Ranvier). It explains all the anatomical peculiarities of congenital cysts of the neck.

As I have said before, the thesis of Savelli's was not available (having sent to Washington for it) until after my conclusions had been reached from a reading of Miss Sabin's article. Her contribution serves, in my opinion, not only to corroborate the conclusions of Savelli, but to throw light on the exact manner in which these fetal arrests occur.

It will prove interesting to compare Savelli's conclusions with the following excerpts from Florence Sabin's article:

"The first evidence of the formation of the lymphatic system is the development of symmetrical sacs in the neck, which have been called jugular sacs. These are found

first in a human embryo 10.5 mm. long (*S. l. j.*, Fig. 1) as endothelial sacs just lateral to the internal jugular veins (Sabin, 1909). In the same year Lewis (1909) described the jugular lymph sacs in four human embryos, 10 mm., in which it consisted of a single sac against the vein. In an embryo of 11.5 mm. he found four or five of such small sacs.

"There is no increase in the length of the sac in embryos between 12.5 and 17 mm. long, but from now on there is a rapid increase in size up to the maximum, which is reached in an embryo 30 mm. long when the size is 5 mm. in length (Fig. 2).

"Fig. 2 is a reconstruction of the primitive lymphatic system in an embryo 30 mm. long, and shows that the stage which marks the maximum development of the jugular sac shows all the other sacs, and that they have been united into a complete system through the thoracic duct. The position of the jugular sac can be seen by comparing Figs. 2 and 3. The level in the section shown in Fig. 3 compares with the line in Fig. 2. Both figures show the great size of the sac, it being by far the largest vascular structure in the neck.

"The jugular sac in this stage shows two other important points—namely, its relation to the peripheral lymphatics, and an extensive bridging of the dorsal border by which the sac is transformed into a chain of lymph nodes.

"The question of the peripheral growth of lymphatics is one which really lies at the root of the new conception of the origin of the lymphatic system of the veins. In studying the peripheral lymphatics it was found that they converged toward, or radiated out from certain centres. These centres proved to be the lymphatic sacs.

"The earliest peripheral lymphatics that have been made out in a human embryo are those from the jugular sac to the skin of the neck in an embryo 20 mm. long. These vessels are shown (*V. l. s.*) in the embryo 30 mm. long, Fig. 2."

From the contributions of Savelli and Florence Sabin, it seems to me that the evidence adduced proves that the lymphatic cavities described by Veau and the jugular sacs described by Sabin are but different interpretations of the same histological facts, and that in these lymphatic cavities, or perhaps more accurately speaking, jugular sacs, we have the fetal anlagen which result by arrested evolution, in the multilocular serous cysts, the nature and disposition of which correspond most accurately with that of these sacs. The absence of a true endothelial investment of these sacs or cysts, may be explained on the theory of atrophy from intracystic pressure (Senn, Lannelongue, Estor, and Massabeau).

In the case I report we have such a type of tumor, which I have ventured to call congenital multilocular lymphocele branchiogenic carcinoma, of which I have an operated case to report, I hope to make the subject of a paper in the near future.

Disease, cyst of neck. Class, multilocular serous cyst. Lymphocele.

Abstract of Case. Lump in neck.

Family History. Unobtainable.

Personal History. Child says he was never sick to his knowledge, save for one time when he sustained an injury to the right foot.

Onset. Patient and also father of patient says the tumor in the neck made its appearance about three years ago and has been of steady gradual growth. Father also said that tumor had been operated twice but there are no marks of any previous operation, so it is thought that only an aspiration was done. As the tumor recurred after each so-called operation and has now reached a larger size than it ever was before, they brought the child to the hospital.

Status Præsens. Well-developed, well-nourished white boy, aged eight years. Temperature, 98.6°. Pulse, 84. Respiration, 24.

Physical Examination. Head: General contour of head is negative, save for the tumor, which will be described below. Eyes, nose, mouth, and ears are normal.

Chest well developed, equal, and of good expansion on either side; resonance and auscultation normal.

Heart sounds good.

Abdomen well nourished; no pathological phenomena manifested.

Extremities negative; good strong musculature.

Surgical Condition. Neck shows at first glance the presence of a large tumor mass on right side of neck extending from mastoid and external auditory meatus down to a finger's breadth from the clavicle at the junction of its middle and inner thirds and from almost the median line posteriorly to the middle of the right inferior maxilla in front. The lobe of the ear is pushed up and outward by the tumor which is continuous with the lower border of the external auditory meatus.

The tumor is not tender to touch, and although it seems to fluctuate throughout it is somewhat firmer at the superior half of the skin it is rather glistening and tense over the tumor.

Fluctuation can be obtained by digital examination in the mouth and a distinct bulging into the oral cavity can be seen.

At the locality where Stenson's duct should empty into the mouth it is noticed that there is some slight redness present, but no tenderness nor any hard mass can be made out.

Aspiration of tumor received a clear straw-colored fluid which was rather sticky to the fingers, and upon standing a distinct gelatinous mass was deposited in the test-tube.

March 19. Aspiration of tumor and fluid obtained, but this time some very small threads of tissue came through the needle and were observed in the syringe. Boiled starch solution treated with dilute tincture of iodin, giving typical blue color, which, upon adding some of the fluid from the

tumor, immediately disappeared and the solution became clear, but the expected maroon color did not appear after eight hours of incubation.

March 20. Reaction of some fluid showed it to be very faintly alkaline. Granulated sugar dissolved in water and treated with the fluid from the tumor and then tried to reduce Fehling's solution result was partial inasmuch as the reduction was to a violet color.

Choreic twitchings noticed on the right side of the face for the last two days.

March 22. Prepared for operation; taken to amphitheatre; given ether and the field of operation sterilized with tincture of iodin.

Incision about five inches long made along the border of the jaw, and by careful dissection the tumor was exposed, found to be cystic multilocular, and to be very closely associated with the parotid gland inasmuch as the gland was very adherent and so much so that part of the gland was removed with the tumor.

The cysts were broken in operation and dissection very difficult; the diagastric muscle was cut, but finally after considerable effort the tumor was freed from its many attachments and removed in its entirety save for a very small cyst that dipped down into deep structures of neck behind the hyoid bone, making its removal impossible. This was treated with tincture of iodin and packed. The wound was closed with silkworm gut.

March 23. Facial paralysis present, but general condition fine.

March 31. Stitches removed; wound, although clean, is discharging some serum. Facial paralysis present.

April 6. Wound closed tightly; paralysis still present.

April 15. Same as last noting.

April 21. General condition good, surgical condition perfect save for facial paralysis, which is improved. Patient discharged with instructions to return for observation every two weeks.

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DISCUSSION

Dr. Samuel J. Mixter, of Boston, Massachusetts.—I think the Association owes a distinct debt of gratitude to Dr. Caldwell by an explanation of the origin of these cysts. The diagnosis beforehand of these cysts of the neck is always very difficult, and on the origin depends the difficulty of their removal or cure. In cysts of the neck more mistakes are made by surgeons than in almost any other class of cysts. They are opened for abscesses; they are drained for various reasons, and then the surgeon afterward knows how to cure them. For instance, a not uncommon thing is a hyoid cyst. There is no condition in the neck where I have seen so many mistakes made, and where the subsequent operation was rendered difficult by the inflammatory process left behind by improper operation.

The ordinary hydrocele of the neck has always interested me, and it is because it is such a pretty piece of dissection to get it out. There is nothing more satisfactory than to go away down underneath the thin wall and have the cyst in your hand afterward, and that can be done in these cases if care is taken in the dissection. The cysts which do not come from the lymph spaces, those apparently that are congenital but filled with material or debris, are also interesting. I remember one

young woman, who was from Kentucky, was in school in Boston, and she had this large tumor. She had it for years, and it was a thin-walled sac filled with what looked like gray material.

The most trying ones are the multilocular cysts when they run from the neck away down into the axilla. These are the difficult ones to get out clean, and you may find them in any part of the tract. I have met them in the abdomen. Retroperitoneal cysts in the abdomen are interesting, and they will shell out perfectly well, but those that run away down from the neck under the clavicle and down into the axilla are the trying ones for the surgeon to get out whole. They are multilocular. We had one very large one from the axilla that we injected with alcohol, hardened, and made cross-sections which showed suitably the partitions and bands crossing. That is a good way to show these tumors after they are taken out.

Dr. A. C. Scott, of Temple, Texas.—I wish to thank Dr. Caldwell for the information he has given us upon this subject, because it is of exceeding interest to me. It was only a short time since I had some experience with cysts of this character, and I must confess that I did not understand their pathology before. I feel Dr. Caldwell has cleared up a situation that has been very mysterious to some of us.

Dr. Mixter referred to cases in which the cysts ran down into the axilla. I have not had them in that locality. I have had them extend into the chest cavity from above, and there is no more interesting situation, after you have succeeded in getting them out without rupture when you have been working within a small area in which you have to work, when you are getting in between the sac and the first rib. When you have to go down below the level of the first rib, you are getting in such dangerous territory that I cannot imagine any situation which makes the surgeon more thoroughly satisfied with himself, and the patient too, when he escapes without having done any serious damage to the tissues in which he is working, and can also have the pleasure of holding the cyst in his hand without rupturing it.

Dr. Caldwell (closing the discussion).—I have only one or two words to say in appreciation of the discussion. In the first place, Dr. Mixter was kind enough to go into these cysts fully, as well as Dr. Scott, who preceded Dr. Blair. I would like to refer to this one explanation of the cyst dipping into

the axilla. You will see in this section here (indicating) that the primitive ulnar vein enters up into the primitive jugular vein, so that the lymph spaces continue on down. In these cases, instead of pushing up to the neck, we may have the same thing pushing down anywhere where we have jugular lymph spaces. There is practically no limitation of the extent to which these cysts may go. It depends upon the amount of fetal arrest and upon the extent at the time of fetal arrest of the formation of these sacs and where located.

In the case of Dr. Matas, where the tumor grew retrocecally, I am quite confident there in the same way a series of lymph sacs formed and it is possible for them to occur anywhere in the abdominal cavity from perivascular spaces which have originated from the vascular structures; that is to say, we have their origin in arrest of development of the lymph sacs, and the formation of multilocular cystic tumors instead of chains lymph nodes.

THE SIGNIFICANCE OF PAIN IN THE RIGHT ILIAC FOSSA IN YOUNG WOMEN

By Randolph Winslow, M.D., F.A.C.S.
Baltimore, Maryland

The occurrence of pain in the right iliac region is always a suggestive, and is generally an apprehensive symptom. Since the public conscience has become so acutely educated in regard to appendicitis, all abnormal sensations in the right iliac fossa are usually ascribed to appendical disease. In many, if not in most, cases the family physician diagnoses appendicitis, and the patient is brought to the surgeon for removal of the appendix. The symptoms of an acute appendicitis are usually sufficiently distinctive; the pain, nausea and vomiting, tenderness and muscular rigidity in the right iliac region, with elevation of temperature, acceleration of pulse, leukocytosis, etc., rendering a diagnosis generally not difficult. Even in chronic appendicitis there is usually local tenderness and rigidity, with constipation and digestive disorders, which direct attention to the seat of disease. In girls and young women, however, who complain of pain in the right side there is an abundant opportunity for a mistaken diagnosis unless a very careful consideration of their symptoms is made. I have many times had such cases referred to me for operation, and have not found any material disease of the appendix, but in most cases some other surgical condition. In some cases no appreciable disease of any organ has been found. Of course it is possible that in some cases there has been a mild appendical attack which has

subsided and has left little or no trace of its previous existence, but such cases ought to be of very infrequent occurrence. Some of these cases are of undoubted hysterical or neurotic nature, but even here there must be some underlying physical cause for the neurosis. In my experience an enteroptosis, or a general splanchnoptosis, is often the cause of the neurosis and of the pain in the right side. In cases of right-sided pain without urgent symptoms it would be well to fill the colon with bismuth solution and skiagraph the large intestine before subjecting the patient to an operation. Of course there may be disease of the appendix coincident with enteroptosis and probably in consequence of this condition as is the case also with nephroptosis. It is probable that useful information could be obtained in cases of appendicular disease by skiagraphy more frequently than is supposed, and I have recently seen a plate that showed clearly a distended appendix, after a bismuth enema. The *x*-ray findings in this case were verified by operation. In cases of pain in the right iliac fossa in a young woman or girl, without urgent symptoms, one should always bear in mind the possibility of an enteroptosis and make a careful examination for this condition. A displaced kidney may also cause pain and other symptoms strongly resembling those of appendicitis, but without elevation of temperature. The kidney can usually be palpated, especially if the patient is placed under anesthesia. It must not be forgotten that nephroptosis and disease of the appendix are often associated. The close relation of the female reproductive organs with the other viscera is also a potent cause of various reflex phenomena not referred to the pelvis. This is especially true in regard to pain referred to the right side. An acute salpingoövaritis may present the symptoms characteristic of acute appendicitis or the two may be associated. Indeed in certain classes of women it will be safer to suspect tubal disease rather than appendical, until a careful vaginal examination shows the pelvic organs not to be at fault. In

the more chronic conditions of pain, and tenderness in the right side without muscular rigidity, elevation of temperature or leukocytosis, one should suspect other organs rather than the appendix. I have operated seven times on young women for supposed appendicitis and have found small ovarian tumors on the right side in each case. A very competent practitioner recently brought to me a young lady to be operated on for a subsiding appendicitis. She had had repeated attacks of pain and tenderness in the right side, but had no muscular rigidity or elevation of temperature when I examined her. At operation the appendix was apparently normal except that the bloodvessels seemed to be rather large and tortuous; the gall-bladder was normal, but on introducing my fingers into the pelvis I withdrew a right ovarian dermoid tumor, the size of a turkey egg. It is quite possible that she had had a subacute appendicitis which had subsided. Another young woman who was recently under my care, was brought ten miles in the automobile of the physician in attendance for an immediate operation for acute appendicitis. I was not convinced that the condition was appendicitis and waited. On operation I found an apparently normal appendix, but a tuberculosis of the right tube and ovary. These conditions could doubtless have been discovered by a vaginal examination, but one hesitates to subject an unmarried girl to such an examination unless there is an urgent reason for so doing.

Cholelithiasis is another condition that may cause pain in the right iliac region in both sexes, especially when the gall-bladder is distended and extends down toward the appendicular fossa. Usually there will not be much difficulty in orienting this condition, especially if the patient is placed under an anesthetic. Percussion over the gall-bladder region will also usually elicit marked tenderness. Stone impacted in the ureter may also give rise to pain in the right side, but in this case there will be urinary symp-

toms, such as tenderness over the kidney, pus and blood in the urine, either visible to the naked eye or seen under the microscope, and other symptoms referable to the kidney or bladder. Abdominal crises due to Meckel's diverticulum, perforating ulcers of the intestines or obstruction, are other conditions that are common to both sexes; pneumonia can also deceive us by presenting symptoms of acute abdominal conditions. This occurs more frequently in children than in adults, and may occur in either sex. The onset of typhoid fever is sometimes attended with pain in the right side, tenderness, rigidity, and elevation of temperature, and may closely simulate appendicitis. One may be easily deceived in such cases, and during the past summer I made this error and removed the appendix of a young girl who had typhoid fever. She made an uninterrupted recovery, but I am still chagrined at the mistaken diagnosis.

Since beginning to write this paper I have read the lecture by Dr. John B. Murphy on this subject, and he lays down the axiom that fever always precedes pain in typhoid fever, while pain always precedes fever in appendicitis.

Whether early pregnancy can produce attacks simulating appendicitis I do not know, but I have recently had under my care a young woman two months' pregnant, who had severe pain and tenderness in the right iliac fossa. She was told by a surgeon in New York that she had appendicitis and required an immediate operation. She did not accept his advice and sometime later consulted me. I discovered her pregnancy, but thought it best to remove the appendix in order to forestall any possible trouble during parturition. She went home after my examination, which was entirely an external one, and was compelled to remain in bed several days on account of pain. She returned later and I removed her appendix, which appeared to be normal. Her gall-bladder was normal as were her pelvic organs, except for the pregnancy. She made an uninterrupted recovery without interference with the course of the pregnancy, but

I do not know what caused the severe pain in the right side. The abdominal crises of tabes may also delude us in certain cases. I have had one case in a woman in which laparotomy was done, without finding any disease of the abdominal organs, and subsequently the evidence of tabes became pronounced.

My object in presenting this paper is to learn rather than to teach. I have been many times surprised and embarrassed at finding other pathological conditions than those I expected to find; and in some cases no appreciable lesion at all. These have usually occurred in girls and young women, but sometimes in men. How can we avoid these errors? I have come to believe that in young women, unless the symptoms of appendicitis are frank and clear, the condition is probably something else. Pain and tenderness in the right side, without rigidity, elevation of temperature and leukocytosis is usually not appendicitis. Again apparently severe and long-continued pain in the right side in girls is more likely to be neurotic than appendiceal. Pain may also be reflected from the pelvic organs or some of the other viscera, and the primary seat of the disturbance might be determined by a more careful examination. I think we frequently operate too hastily on a diagnosis of appendicitis, without considering sufficiently the other possibilities in the case.

DISCUSSION

Dr. W. L. Rodman, of Philadelphia, Pennsylvania.—I feel that this is too valuable a paper to pass without discussion, as I have very recently had the case of a child, sent to me from New Jersey, that was supposed to be a well-marked cases of appendicitis, and yet it proved to be a typical lobar pneumonia. This is one of quite a number in which the mistake was made. Also I have often known acute thoracic symptoms to follow inflammatory diseases in the upper abdomen. He may have referred to it, but I do not recall that Dr. Winslow mentioned

ureteral calculi. That mistake I have made twice. I should not have made it because in ureteral calculi we usually have an afebrile condition and no leukocytosis.

Dr. Winslow has called attention to a very important subject, and I am sure that most of us have made such errors. So practical a paper should lessen their frequency in the future.

Dr. Hubert A. Royster, of Raleigh, North Carolina.—In going over the conditions which may be mistaken for appendicitis one should not be inclined to criticise Dr. Winslow too severely for his typhoid fever case. I am sure there is not a man in this hall who has not been guilty of the mistake or at least on the verge of it. In order to make myself feel more comfortable I will say that in one case I found a pure typhoid culture in the appendix, and the pathologist told me it was an acute typhoidal appendicitis. I can conceive that a condition might arise demanding the removal of the appendix in spite of the enteric fever.

Three other conditions have interested me very much, one in which a twisted ovarian cyst pedicle fooled me completely. In fact, the clinical picture was so definite that it was almost impossible to tell beforehand whether it was a large appendix abscess or whether it was a pelvic condition. Second, a complete psoas abscess which had not yet come down through the fascia, and then in a case of pneumonia, which Dr. Rodman referred to, we saved ourselves from a mistake by heeding the playing of the alæ of the nose.

Dr. Walter C. G. Kirchner, of St. Louis, Missouri.—I wound like to call attention to one condition that I am sure is found much more frequently than has been observed, and I think is the result of a small incision that is usually made in cases of operations for appendicitis. Several times I have operated on cases that were operated on by some one else for appendicitis, and the real cause was overlooked. I have special reference to the cases of ptosis and such cases in which there are often bands, Jackson's membranes, and the like. Frequently in these cases there is a band eight or ten inches, from the ileocecal valve, which produces a kink in the ileum with symptoms similar to those of chronic appendicitis, and it is in such cases where I have had to operate subsequently on patients in whom the appendix had been removed and where it was, necessary, to relieve the constriction and to straighten out

the intestine. The band itself has been described by Dr. Coffey and by Dr. Mayo, and it is found quite frequently in my experience, and should always be looked for in these doubtful cases of appendicitis. The history is usually one of chronic appendicitis and the pain can be elicited by pressure as in appendicitis, only the pain, as a rule, is situated a little nearer the umbilicus. I believe in operations for appendicitis one should not overlook this condition, which I am sure is quite frequent.

Dr. R. E. Fort, of Nashville, Tennessee.—One source of error in diagnosis which Dr. Winslow failed to mention fell to my lot. It was an inflammatory lymph node retroperitoneally in the ileolumbar chain. The case simulated appendicitis so strongly that the abdomen was opened, the parietal peritoneum separated and the lymph node found at the bifurcation of the common iliac artery. I have seen it but once, but it is one source of error which I think may be added to the list Dr. Winslow has given us.

Dr. Francis Reder, of St. Louis, Missouri.—The conditions described by Dr. Winslow are not of a serious nature. When we go back to the mechanical conditions that produce intestinal stasis, but not to the point of severe constipation, we find particularly an attachment of the sigmoid, next the splenic flexure, and next the hepatic flexure, and coming down to the cecum. In our work in intestinal surgery we find there is more or less descent of the cecum and it may be so moderate as not to cause the formation of these bands to which Dr. Kirchner has alluded. However, there may be a variation in position of the appendix, which is very much in doubt, it being carried down toward the pelvis by the cecum. There is usually a little attachment of the appendix to the mesentery of the small bowel, and it is this attachment which forms the so-called band which cannot escape the operator's notice at the time. It forms something of a hammock for the loop of ileum to be caught in and bring on a potential obstruction. There is not enough accumulation of excrementitious matter in that portion of the bowel to give a clinical picture simulating chronic appendicitis. I have frequently operated for a clinical picture sufficiently pronounced to warrant operation and have found a normal appendix. With my finger I have snapped or separated the little attachment, removed the appendix, but the appendix was normal. The patient, however, recovered.

Dr. Battle Malone, of Memphis, Tennessee.—We have all been interested in Dr. Winslow's confessions and some of us could likewise make similar confessions.

There was one point brought out by Dr. Royster in his discussion that I think should be questioned. He called attention to operations for appendicitis during typhoid fever, and in one case he had operated. Murphy calls attention to this condition, and I think his reasoning is sound and his conclusions should be accepted. He says definitely that we should not operate on these acute cases of appendicitis during typhoid fever for the reason that we never have perforation in this type of appendicitis, or it is so rare as to be negligible. We should wait, and if the appendix has been crippled by the attack later on, remove it.

Dr. Willis F. Westmorland, of Atlanta, Georgia.—There is one point that has not been brought out in this discussion, and that is the one with reference to the gas condition. We may have adhesions occur around the cecum from typhoid fever, intestinal toxemia, or any mechanical factor like a pathological retroverted uterus, or a fissure in ano, which prevents the distribution of gas, and these patients will present typical symptoms of appendicitis without temperature. In my experience the pain extends over a larger area. It is not limited to the area that you expect to find in appendicitis, but extends over a much larger area, and this is particularly true when you get your fingers in position to press against the distended cecum. Some of the worst cases of simulated appendicitis I have had have been in those cases where it was probably due to lesions that occurred a long time previously, but due to causes that produced pain, and with some mechanical or infective factor of the colon which caused a large amount of gas and intense suffering. Sometimes the gas was so persistent that the patients suffered for quite a period of time. These cases were usually relieved promptly by breaking up the adhesions and by correcting the mechanical factor, whatever it was. I am more inclined to believe from extended experience that these adhesions are due to intestinal toxemia, primarily because we find them extending over a long period of time in which there is no history pointing to acute lesion of the appendix. Of course, the appendix in these cases is a primary factor of infection of the bowel and should be removed, and I suppose is removed by most surgeons, whether it is involved or not.

We recently had at the Grady Hospital several cases which were interesting and in which the *x*-rays showed a distorted condition of the cecum before operation. Two of them were operated on recently and it was found the adhesions practically involved the whole ascending colon. The adhesions made folds in which the gas seemed to be unequally distributed and seemed to remain there. It did not have the power of escaping. In these cases the patients sometimes suffered very intensely.

Dr. Hubert A. Royster, of Raleigh, North Carolina.—If I may be allowed to correct an impression which I did not intend to convey, I will say in reply to Dr. Malone that he misunderstood my attitude. I did not say that I would premeditately operate upon a patient with typhoid fever who also had appendicitis; but having made a mistake I felt much better that the pathologist found a pure culture of typhoid in the appendix.

Dr. Frank D. Smythe, of Memphis, Tennessee.—Dr. Winslow has opened an interesting field for discussion, and one that comes within the domain of every surgeon almost daily.

My experience has been that in every case where I was unable to make a positive diagnosis of appendicitis in patients complaining of pain in the right side, not limited, I have not found the appendix responsible for the pain.

There is something else besides appendicitis responsible for the pain in those patients who fail to submit a history of appendicitis.

In the absence of our ability to make a positive diagnosis of appendicitis, we had better be prepared to do something besides operation for removal of the appendix.

Such cases are not cases of appendicitis, and more errors in diagnosis are committed in these cases to the detriment of the patient than in almost any region of the body.

As to the causes of producing pain in the right side the essayist has covered most of them that are usually responsible for it. I desire to supplement his contribution to this extent, namely, pregnancy as being responsible for pain in the right side.

A short time ago, within the last month, there was referred to me a woman who was five months pregnant, for an emergency operation for appendicitis. I was upbraided by the physician, a friend of mine, for being apparently dilatory in responding to the call. He was at the hospital with the patient.

A history of chills was given, followed by fever, a quick pulse, for a period of three days, with pain, general over the belly, but mostly on the right side.

A diagnosis of appendicitis with peritonitis had been made and the case in his opinion demanded immediate operation.

Examination of the patient satisfied me that there was nothing the matter with the appendix. The woman was five months pregnant. She had pain on the right side, and there was pronounced pain upon fist percussion over the right kidney. Examination of the urine disclosed pyuria; in other words, my patient had a typical case of pyelitis.

We kept her under observation for a week or ten days and then sent her home without operation. The physician was somewhat dissatisfied because I declined to operate on his diagnosis of acute suppurative appendicitis with general peritonitis at the outset, though he finally became convinced that we were correct in diagnosis and treatment.

Another case was one of torsion of the pedicle of an ovarian cyst, right, which was diagnosed as stone in the kidney. The patient had peritonitis from rupture of the cyst, which was disclosed at operation.

I saw the patient at a time when it was unnecessary to spend time in an effort to determine the cause of the peritonitis, but to do something for the condition, if possible, without delay. She was drained for general peritonitis and the true condition discovered.

If the careful surgeon is unable to make a positive diagnosis of appendicitis from the history given, then he must appreciate the fact that some other cause and not the appendix is responsible for the pain in the right side.

Dr. Winslow (closing the discussion).—I am very thankful for the remarks that have been made. The object I had in view was to elicit discussion and especially to get information for myself how to avoid these errors. Medical men bring patients to us who have pain in the right side and say they have appendicitis. They tell the patients they have appendicitis and that they need an immediate operation. It is embarrassing from two points of view. If you do not operate it is embarrassing, and if you do operate it is embarrassing. Of course, the embarrassing feature is not important. A few years ago we thought, practically, all pains in the right side were due to appendicitis; continuous experience has shown us, however,

that a great many things that produce pain in the right side are not appendicitis, and the position I have come to is that if the symptoms of appendicitis are not clear, the probability is that the case is not one of that disease. Often there is some definite surgical condition that can be repaired or relieved by an operation, but sometimes there is no definite surgical condition that can be discovered.

POSTOPERATIVE ACUTE DILATATION OF THE STOMACH

By E. P. Hogan, A.M., M.D.
Birmingham, Alabama

The frequency of postoperative acute dilatation of the stomach with its high mortality will, I hope, justify your devoting the time and consideration to the subject which has been given in the arranged program for this meeting.

Acute dilatation of the stomach was discussed by Rokitansky in the first edition of his hand-book on *Pathological Anatomy* in 1842. Briton, in 1859, also discussed the subject. Hilton Fagge, in 1872, gave an accurate description of the characteristic symptoms and physical signs. In 1902 Campbell Thompson collected 44 cases, most of them with autopsy reports. Later Neck gave a review based upon 60 cases. Kundrat, in 1891, reported 3 fatal cases, and in 1895 Schnitzler reported 1 fatal case. Albrecht, in 1899, published a very complete and careful study of the subject. He reported 2 cases of acute gastric dilatation with mesenteric constriction of the duodenum. In 1900 Robinson, of Chicago, called attention to the possibility of mesenteric compression of the duodenum and reported a fatal case associated with an enormous dilatation of the stomach. A. E. Halstead of Chicago reported a fatal case operated on by him in 1902. He gave a most interesting review of the literature and an able discussion of the subject. In 1906 Finney also reported a fatal case operated by him in 1904. He gave the autopsy findings and a most able discussion of the subject with a review of the literature. In

1907 Bloodgood reported cases with atuopsy findings and made a very valuable contribution to the literature on the subject. In March, 1907, Lewis A. Connor gave a review of the literature on the subject and a discussion based on 102 collected cases.

Cases have been reported and the subject discussed by many other able surgeons. German and English surgeons have made valuable contributions. The latest review that I have seen of the literature on this subject is by Borchgrevink, of Christiania, Norway. This is a most comprehensive review of the literature and an able discussion of the subject.

My report of cases is based upon the clinical picture observed at the bedside. I do not attempt to differentiate between acute dilatation of the stomach and gastromesenteric ileus. I agree with Finney in the statement that these conditions cannot be differentiated clinically.

Case I.—Supravaginal hysterectomy. Mandy R. Admitted to the Hillman Hospital September 14, 1909.

A large, well-nourished colored woman, aged forty years, with a history of an abdominal tumor of fifteen years' standing, which has continued to increase in size. She complains now only of the inconvenience caused by the large tumor.

Physical Examination. Heart and lungs negative. Abdomen large with an abundance of adipose tissue. Liver apparently not enlarged, and gall-bladder not palpable. Spleen not palpable. Bimanual examination, cervix hard and a large, firm, movable mass filling the entire pelvis and extending into the abdomen. Urine negative. Temperature, 98.5° F.; respiration, 20; pulse, 96.

Operation. Supravaginal hysterectomy, median incision. Large fibromyoma removed. Patient returned to ward in good condition. She did finely until the afternoon of the third day, when the pulse became very rapid and irregular; respirations also rapid. At this time it was noticed that

the patient spat up frequently large gulps of black fluid. A short time thereafter, she vomited a large quantity of similar fluid. This was at 4 P.M. on the third day. At 8 P.M. she vomited again a large quantity of fluid of the same character. At 9 P.M. she vomited a large quantity of black fluid which had a very offensive odor. At this time, her pulse was rapid, irregular, and weak: Pulse, 140; respiration, 50. Patient seemed to be in extreme prostration, and notwithstanding the large amount of fluid that had been vomited, the stomach appeared to be of enormous size and to extend below the umbilicus. On percussion the abdomen was dull and the stomach seemed to fill the entire cavity. The great distention and evident disturbance in the upper abdomen dominated the picture, and one was forced to the conclusion that here was the cause of the fast pulse, rapid respiration, and elevated temperature. The stomach was ordered washed and while this was being done the patient died. Just before death the temperature was 101° F.; pulse, 140; respiration, 50.

An autopsy, although urged and insisted upon, was not permitted. I was most anxious to confirm a diagnosis of postoperative acute dilatation of the stomach. From the clinical picture, I made this diagnosis a short time before death. I have to regret in connection with this case, that I was not more familiar with the literature on this subject; had I been, I think I should have detected the acute dilatation earlier, when the treatment for the condition should have been instituted.

CASE II.—Gunshot wound of abdomen. Gordon C., tall, well-nourished white man, aged nineteen years, admitted to the Hillman Hospital January 14, 1912, a few minutes after having been shot in the abdomen by a pistol ball, the bullet entering the abdomen on the left side about the mid-axillary line and on a level with the costal margin. No evidence of bullet emerging. Patient was prepared for immediate laparotomy. Morphine (gr. $\frac{1}{4}$) and atropine

(gr. 150) preceded the ether narcosis. A median incision was made above the umbilicus. On opening the abdomen, a large quantity of blood filled the cavity and fresh blood rapidly reappeared. The spleen was examined and it was found that about one inch of the lower extremity of this organ was torn almost completely off. There was a profuse hemorrhage from this source. A large gauze pack out of hot normal salt solution was applied to this lacerated extremity. The liver, mesentery, stomach, and intestines were carefully examined. The only other injury discovered was a laceration of the posterior wall of the stomach. This was sutured with catgut. At this time the patient was doing very poorly. Pulse very weak and irregular and respirations shallow and slow. The fact is, the anesthetist announced that the patient had quit breathing. On first discovering the injury to the spleen, I decided to do a splenectomy after other bleeding-points had been controlled, but as the condition of the patient was now alarming, I believed that this could not be done. I decided then to pack the spleen, hoping in this way to control the hemorrhage permanently. A large gauze pack was placed around the lower extremity of the organ, the end of the pack being brought out just below the point of entrance of the bullet. Oxygen was given and venous infusion of salt solution, 1200 c.c. The patient's condition began to improve at once. A cigarette drain was placed in the pelvis just above the symphysis. The original incision was closed with through-and-through silkworm-gut sutures. The patient was carried to the ward with a pulse of 120. He was given morphin, continuous proctoclysis, and strychnin (gr. 30) and spartein (gr. 2) every four hours.

Patient vomited black fluid soon after being carried to the ward and repeated the vomiting once within an hour. He also vomited black fluid twelve hours later. He was restless and asked for water frequently. Four hours later he was very restless and vomited a large quantity of dark

fluid. Morphin was given (gr. $\frac{1}{4}$). He vomited again a large quantity of the same fluid six hours later. The patient was given morphin (gr. $\frac{1}{4}$) and it was repeated four hours later. At 6 A.M. on the morning of the second day he complained of severe pain in the stomach. He continued to complain of this pain during the entire day and notwithstanding the fact that morphin was given at frequent intervals, he was extremely restless. He vomited dark, sour, offensive fluid at intervals. Patient continued to vomit this dark offensive fluid, was extremely restless, and at times delirious. At 7 P.M. on the evening of the third day he became suddenly worse. I received the information that he was dying. I immediately went to the ward and saw that the patient was in a very critical condition. Pulse rapid, irregular, and weak, and respirations very shallow and infrequent. On examining the patient it was found that the abdomen was greatly distended and dull on percussion. There seemed to be a large quantity of fluid in the abdomen. At this time I was convinced that the stomach was really the cause of the trouble and there was no other cause for this serious condition of the patient. The stomach was at once washed and a very large quantity of very offensive fluid was removed. Normal salt was used, but the washing of the stomach was not done as thoroughly as I should have liked, as the patient was cyanosed and breathing very poorly. The patient soon appeared greatly relieved by the removal of this large quantity of very offensive fluid. He vomited again at 8.30 A.M. on the fourth day, and also at 3 P.M. on the same day, but it was evident that the stomach was still distended and there was pain and discomfort from pressure. The stomach was thoroughly washed after each vomiting. My orders were then to wash the stomach after each attack of vomiting, to place the patient in the horizontal right lateroprone position, nothing by mouth, morphin (gr. $\frac{1}{4}$) and repeat if necessary to make the patient comfortable, and continuous proctoclysis. After the stomach was thoroughly washed

and these orders were carried out, the patient went to sleep and slept for six hours. On awaking he was nauseated and vomited a large quantity of green fluid. The stomach was again washed and the above orders carried out. He went to sleep and slept for four hours. On awaking he vomited about an ounce of greenish fluid. At this time eserin (gr. $\frac{1}{100}$) and spartein (gr. $\frac{1}{2}$) were given. The rectal tube was ordered inserted for thirty minutes. One hour later a glycerin enema was given. A large semisolid stool with flatus was expelled. The patient again vomited five hours later. The stomach was thoroughly washed again and the above treatment carried out. There was no further nausea or vomiting after this. For the next two days eserin (gr. $\frac{1}{100}$) with strychnin (gr. $\frac{1}{30}$) and spartein (gr. $\frac{1}{2}$) were given, followed an hour later by glycerin enema. A daily bowel movement from enema, eserin or a mild purge each day during the convalescence. The patient developed acute bronchitis on the eighth day, which gave him much trouble.

The suprapubic drain was removed on the third day. The pack was removed on the seventh, eighth, ninth, tenth, and eleventh days, after which the cavity was irrigated daily with normal salt solution until closed. The patient was cured and discharged from the hospital February 22, 1912.

Case III.—Gunshot wound of abdomen. Dennis L., large, well-nourished colored man, aged twenty-six years. Entered Hillman Hospital May 26, 1912, suffering with a gunshot wound of the abdomen.

Physical Examination. Heart and lungs negative. Abdomen rigid and very tender on pressure. Respiration, 26; pulse, 120; urine negative.

Bullet entered abdomen just above the umbilicus.

Immediate laparotomy.

Operation. Median incision extending above and below the umbilicus. On opening the abdomen blood-clots and

fresh blood appeared. The blood-clots were removed and the great omentum was found to be torn and bleeding freely. The gastro-epiploic arteries torn and bleeding. Clips were placed on points of hemorrhage and other sources of hemorrhage sought. On examining the liver, the under surface was found to be torn and bleeding freely. It was packed with gauze out of hot normal salt solution. No other source of hemorrhage was found. The epiploic arteries and the points of hemorrhage in the omentum were ligated and the tear was sutured. After removing all blood-clots from the abdomen and pelvis, a suprapubic cigarette drain was placed in the pelvis, the gauze pack brought out external to the right rectus muscle and opposite the ninth costal cartilage. The median incision was closed with through-and-through silkworm-gut sutures.

Postoperative. Patient did well except a slight bronchitis until the twelfth day, when he complained of epigastric pain, nausea, oppression, general discomfort, and nervousness with rapid pulse and respiration. On examining the abdomen general distention was observed. The stomach tube was introduced and a large quantity of green fluid removed. The stomach was thoroughly washed with normal salt solution. The patient was placed in the horizontal right lateroprone position, morphin (gr. $\frac{1}{4}$) given. Nothing by mouth, with continuous proctoclysis. There was a free bowel movement within twelve hours, and water and liquid were given at the end of twenty-four hours. There was no further trouble. Patient was well and discharged from the Hospital June 24, 1912.

Case IV.—Daisy H., colored woman, aged twenty-seven years. Entered Hillman Hospital October 19, 1912, complaining of severe pain in each iliac region.

She is the only living child of four children. Parents dead. Married ten years, three miscarriages, the last five years ago. No living children.

Physical Examination. Head and chest negative. Abdominal muscles markedly rigid and tender on pressure. Liver and spleen negative.

Bimanual Examination. Cervix negative, rigid and tender in right and left iliac regions, with a large, elongated, slightly movable mass on either side. Uterus slightly movable. A moderately large, hard, round, movable mass seemed to be attached to the uterus.

Operation. October 21, 1912, median incision between symphysis and umbilicus. Pedunculated fibroma removed and double salpingectomy. The tubes were subacute and leaking. Two suprapubic cigarette drains.

Postoperative Treatment. Fowler position, strychnin, spartein and proctoclysis. Patient did well until the third day, except as to kidney function, which was about 10 oz. for each twenty-four hours. On the third day patient expectorated copious amounts of a dark green fluid. Rapid pulse and respiration, temperature subnormal, anxious expression, intense pain in the epigastrium, which was markedly distended and dull on percussion. Patient vomited a large amount of dark green fluid. Epigastrium still distended and pain only slightly relieved by vomiting. The stomach tube was inserted and a very large amount of dark green fluid was obtained. The stomach was thoroughly irrigated with normal salt solution. Patient was changed from the Fowler to the horizontal right lateroprone position, morphin (gr. $\frac{1}{4}$) given, proctoclysis and everything excluded by mouth. Patient went to sleep and slept for four hours and when she awoke she was refreshed, no nausea, pain or discomfort. Patient was kept on right side for forty-eight hours, after which any position was allowed with liquid nourishment. She was discharged cured November 10, 1912.

Case V.—Elinor L., well-nourished colored woman, aged twenty-four years. Entered Hillman Hospital January 7, 1913. Family and personal history of no special interest.

Physical Examination. Negative, except pain in right and left iliac regions. Temperature, 99; respiration, 20; pulse, 84; leukocytes, 13,000.

Bimanual Examination. Cervix hard. Uterus slightly movable but rather fixed on the right side. A mass in right iliac region, very tender in left iliac region.

Operation. January 9, 1913. Median incision between symphysis and umbilicus. Resection of left tube and salpingectomy of right; also appendectomy. Closed without drainage.

Postoperative Treatment. Nothing unusual until the morning of the third day, when there was nausea, but no vomiting. The stomach was washed, but water and liquids were not excluded. Stomach washed again in evening. Kidneys and bowels acting freely. On the fourth day nausea continued. At 2 P.M. on the same day, the patient suddenly became cold and clammy, pulse could not be counted, respirations shallow and rapid, extreme pain in the epigastrium, expression anxious, death seemed impending. The stomach-tube was inserted and an incredibly large quantity of green fluid returned. The stomach was thoroughly irrigated with normal salt solution. Patient was placed in the horizontal right lateroprone position, morphin not given because of the extreme prostration. Continuous proctoclysis, everything by mouth excluded. At the end of twenty-four hours, hot water was allowed, and at the end of forty-eight hours liquid diet. There was no further trouble, and the patient was discharged cured January 23, 1913.

CASE VI.—Gunshot of lung and abdomen. Will L., large well-nourished colored man, aged twenty-four years. Entered Hillman Hospital May 10, 1913, at 11.30 P.M., after having been shot with a pistol ball one hour before. He was prepared for immediate operation.

Physical Examination. Abdomen distended, rigid, and painful on pressure. Bullet injury of chest about two

inches external to the midaxillary line, breaking the sixth rib. There being evidence of the bullet having entered the abdominal cavity, laparotomy was done at once.

Operation. Median incision above the umbilicus. On opening the abdomen free blood was found, and the hemorrhage seemed to come from under the surface of the liver. On examining this organ it was found that there was a large laceration of the under surface of the right lobe of the liver. This was packed and other sources of hemorrhage were sought. The spleen, stomach, mesentery, and intestine were examined, but no injury discovered. There was a large retroperitoneal hematoma in the epigastrium. This hematoma was not opened for fear of an uncontrollable hemorrhage. An effort was then made to suture the injury in the liver, but I was unable to do this. I then packed the injury with gauze out of hot normal salt solution. An opening was made external to the right rectus muscle and opposite the ninth costal cartilage through which the gauze pack was drawn. A suprapubic cigarette drain was placed in the pelvis. The original incision was closed with through-and-through catgut sutures.

Postoperative Treatment. Patient was given 1000 c.c. of normal salt solution intravenously during the operation. Morphin as required after operation and strychnin and spartein every four hours with continuous proctoclysis. Patient vomited a large quantity of black fluid three hours after the operation. Was very restless and asked for water continuously. He continued to vomit every two or three hours. The stomach was washed repeatedly. He had pain in the epigastrium, hiccough, nausea, fast pulse, and respiration. After each washing of the stomach, he felt better, but continued to beg for water. His thirst was unquenchable. Notwithstanding the frequent vomiting, his stomach would become distended within two to four hours, giving him great pain and discomfort. Liquid nourishment and water were limited, but not excluded until the

seventh day, when everything by mouth was excluded. The stomach was again washed. A large quantity of green fluid was obtained. He was given continuous proctoclysis and was forced to remain in the horizontal right lateroprone position; morphin was given as required. At the end of twenty-four hours, he was given hot broth every two hours. The stomach gave no further trouble. The kidneys acted freely from the beginning and there was a free bowel movement on the third day and one or two bowel movements each day until the fifth day, when diarrhea developed. This continued for two days.

The suprapubic cigarette drain was removed on the third day. The liver pack was removed on the seventh, eighth, and ninth days. The patient was well and discharged from the Hospital May 31, twenty-one days after operation.

Case VII.—Alf. M., a large, well-nourished colored man, aged twenty-four years, admitted to the Hillman Hospital October 13, 1913, at 6.30 P.M., having been shot in the abdomen at 6 P.M. of the same day.

Family history of no special interest. Personal history negative. Does not use tobacco or alcohol.

Physical Examination. Head and chest negative. Abdominal muscles rigid and tender on pressure. Bullet injury external to the left rectus muscle and two inches above the umbilicus. Urine negative. No radial pulse.

Operation. Median incision extending above and below the umbilicus. Blood-clots and fresh blood appeared. Points of hemorrhage were sought and found to be from perforations in the jejunum and its mesentery. There were three through-and-through perforations of the jejunum, extending from the lacerated mesenteric border and including almost the entire circumference of the intestine. It was necessary to resect 18 inches of the jejunum. An end-to-end anastomosis was made—inner suture, Connell's continuous, outer suture, Cushing's. Intestinal contents and

blood-clots were removed from the abdomen. Two suprapubic cigarette drains were placed in the pelvis and the original incision was closed with catgut and silkworm gut. Hypodermoclysis and intravenous salt solution were given during the operation.

Postoperative Treatment. Radial pulse imperceptible and respiration shallow and infrequent when returned from the operating room. Four hours later, respiration, 30; pulse, 100. Strychnin and spartein were given every four hours, proctoclysis continuous, Fowler position, and morphin as required. Patient reacted finely and did well until 7 A.M. on the third day, when he complained of epigastric pain and nausea and vomited a small amount of brown fluid. He vomited small amounts of the same fluid at frequent intervals during the day. Patient had hiccough at intervals during the day. There was pain but no apparent distention of the epigastrium. At 7 P.M. it was noticed that the patient was very nervous and restless. At 8 P.M. the patient vomited a large amount of dark green fluid. Respiration, 28; pulse, 120; temperature, 99.6°. After vomiting, he said that he felt greatly relieved. He was afraid of the stomach tube and begged that the stomach be not washed. The pain, nausea, belching, and general discomfort soon returned. At 10.30 P.M. he vomited a large amount of dark green, almost black fluid. He was still reluctant to permit his stomach to be washed. At 1 A.M. the above symptoms returned and he vomited a large quantity of fluid of the same character. At 2 A.M. I was called to see the patient and found him prostrated with a rapid, weak pulse, shallow and rapid respiration, anxious, pinched expression, and very nervous. The epigastrium was distended and seemed to extend to the left and below the umbilicus. The stomach-tube was inserted and an incredible quantity of dark green, almost black fluid with a very offensive odor was obtained. Patient was greatly relieved. Up to this time, although water had not been excluded, very little had been taken.

After washing the stomach, the bed was placed horizontal and the patient was placed in the right lateroprone position, morphin (gr. $\frac{1}{4}$) continuous proctoclysis, and everything excluded by mouth for thirty-six hours, when hot broth and water were permitted. Patient had no further trouble and improved rapidly. Bowels moved on the fourth day, and one or two movements each day thereafter. Kidney function was diminished until the fourth day. One suprapubic drain was removed on the third day and the other on the fifth. Patient was given light diet on the sixth day and regular diet on the fifteenth day. He was discharged cured November 9, 1913.

There is no unanimity of opinion as to the cause of postoperative acute dilatation of the stomach. Time will not permit a review of all of the many theories that have been advanced to explain the cause. Brief reference will be made to a few of them.

Rokitansky states: "At one or more points of the intestinal canal incarceration of one loop may be caused by pressure upon it by another part of the intestine or its mesentery. It takes place only from before backward against the stiff, unyielding abdominal wall." He says this occurs most frequently where there is a long slack mesentery. He says, "In this category belongs the compression of the lower portion of the duodenum by the mesentery of the small intestine and the superior mesenteric vessels and nerves contained therein."

Albrecht gives a full discussion of the various causes which may lead to the mesenteric compression. He considered the distended stomach itself as a direct cause of the mesenteric compression and ileus symptoms. He says motor insufficiency plays a possible indirect important role.

Glenard, Kundrat, Schnitzler, and others have discussed possible causes.

Müller thinks this form of compression can come to pass

from a horizontal position on the back, and that this is the most important contributing cause. He thinks it is favored by the fact that in postoperative cases the purgation before operation leaves the intestine entirely empty, and that it is also favored by the weakening influence of the narcosis. In this condition the empty small intestine needs only to sink into the pelvis, provided its mesentery is of sufficient length. He is also of the opinion that compression of the duodenum is always the primary cause and that dilatation of the stomach is of secondary origin.

Stieda thinks the primary cause is an acutely increasing atony of the stomach and duodenum, and that the obstruction by the mesentery is secondary. The dilatation of the cecum and ascending colon sometimes observed, he thinks, is due to the fact that the dilated stomach produces a kink at the hepatic flexure by pushing down the transverse colon.

Thompson thinks the primary cause, the paralysis of the stomach walls, and discusses at some length the conditions giving rise to this.

Box and Wallace advocate the idea that the tense distention is due to actual pressure of the stomach upon the part of the duodenum which crosses the third, and ascends by the side of the second lumbar vertebra to end in the jejunum. They think that in order to explain the phenomena met with, there must be (1) a paralytic condition of the viscus which leads to distention, and then at a certain stage (2) the distended stomach actually produces obstruction by pressure of the duodenum against the front and left side of the spinal column.

The experiments of Albrecht and also of Box and Wallace and observations on cadavers by Bloodgood, as well as by others, prove conclusively that in many cases of acute dilatation of the stomach or of gastromesenteric ileus the duodenum is obstructed between the root of the mesentery which passes in front of it and the vertebral column behind.

Borchgrevink thinks where this condition is not found the pathologist has not been acquainted with it or has neglected to search for its presence.

Fagge and others think an excessive secretion a primary factor. Campbell Thompson says: "The most likely explanation seems to be that the stomach wall becomes paralyzed, and then later on, the organ becomes distended by gas or excessive secretion." Stomach peristalsis observed by Bloodgood and others after the onset of the symptoms as well as the observed incomplete emptying of the stomach by vomiting during the complication is evidence against complete paralysis. Hypersecretion has been present in every case observed by me. R. T. Morris in discussing acute postoperative dilatation of the stomach Frebuary 20, 1901, attributed the condition to toxines. He gave a most interesting discussion of the origin and effect of these toxins as the cause of acute dilatation.

Symptoms. The symptoms are nausea, vomiting, pain, thirst, abdominal distention, oppression, rapid, weak, and irregular pulse, shallow and frequent respiration, prostration and oliguria.

The vomiting may be frequent or at longer intervals. The color of the vomitus is usually greenish at first and later becomes dark brown or black. It may be in small quantities, mere gulps, or the quantity may be enormous. Whatever the quantity may be, the stomach does not completely empty itself. The vomitus at first is odorless and later becomes very offensive. I have never observed feculent vomitus in a case of acute dilatation of the stomach. Should it become feculent I would change my diagnosis to an obstruction below the duodenum. In my cases abdominal pain has been present; it is marked in the beginning. Unusual thirst may first attract attention to the case. It is intense and unquenchable. Patients will beg for fluids and on being denied, many of them will show their depleted and nervous condition by crying. Abdominal

distention is usually present from the beginning. Later it becomes marked, beginning in the epigastrium, extending rather to the left, and may involve the entire abdomen. The abdomen is tender. It is most pronounced in the epigastrium. Later the pain is not so marked. As the stomach becomes more distended, the oppression becomes unendurable. The pulse becomes rapid, weak and irregular. Respiration becomes rapid and shallow. Oliguria is usually observed from the beginning. Bowels are usually constipated. The patients are nervous and restless at first and later they become anxious, careworn, and fearful of the outcome. Prostration becomes marked. In some cases, hiccough and cyanosis have been observed.

Diagnosis. All of the above symptoms may be present, but they are not uniformly present. Persistent nausea and vomiting, epigastric pain, restlessness, thirst, and distention may all be present. Should anyone of them be noticed, the case should be regarded with suspicion and should be watched very carefully in order that the complication may be detected at the earliest possible moment. When the case has been permitted to continue with suggestive symptoms until the complication becomes pronounced, the stomach involvement, with its train of symptoms, will then be so evident that the diagnosis is conclusive. Peritonitis and intestinal obstruction below the duodenum are conditions for which the trouble is most often mistaken. The stomach tube and the non-feculent vomitus with the symptoms above enumerated will eliminate the intestinal obstruction. The stomach-tube, leukocyte count, temperature, rigidity, and the absence of the initial epigastric pain will almost surely differentiate peritonitis. The other symptoms enumerated for acute dilatation of the stomach are not so pronounced in peritonitis.

Prognosis. In 1906 Finney stated that the vast majority of cases have resulted fatally in spite of all measures instituted for their relief. Recently, however, a few cases of

recovery have been reported. Conner's statistics for 1907 show a mortality of 72.5 per cent., and Laffer's for 1908, a mortality of 63.5 per cent. Of the 144 cases collected by Borchgrevink and reported in June, 1913, 78 or 54.1 per cent. died. While the mortality as shown by the above figures is extremely large, yet from the cases that are reported where the condition is recognized early and treatment promptly inaugurated, we are gratified to find that this mortality rate is being rapidly reduced.

TREATMENT. There is great unanimity with reference to the importance of the early and repeated use of the stomach tube. The prone position was suggested by Schnitzler. He said: "Let the patient lie prone in bed." Kelling suggested placing the patient on the left side with elevated pelvis.

Bloodgood, in 1907, said: "Prompt treatment with the stomach-tube and irrigation, repeatedly performed is the first requirement. This should be associated with change in position—knee-chest, and left lateral with elevation of pelvis. When the dilatation of the stomach persists and the accumulated fluid fails to pass, and the patient becomes weaker from loss of food, operation should be performed."

Ziegler, September 17, 1912, reported a recovery in a case following Cesarean section. The stomach was washed for thirty-three days and in all over 200 times. The stomach was washed as often as every two hours.

Moynihan states, in 1906: "In my own few cases, relief has always been given by changing the position of the patient. He must be placed prone in bed, with a pillow beneath the pelvis. One acts upon the supposition that there is compression of the duodenum by mechanical traction upon the superior mesenteric vessels. Whether the hypothesis be right or wrong, relief is undoubtedly afforded, sometimes in a most remarkable manner, by the change of the posture."

Of 48 cases collected by Borchgrevink in which the

stomach tube and not the abdominal posture was used, 24 of the cases died. Of 22 of his collected cases treated by operation, 17 died. It should be said, however, that 1 of the 17 cases on which gastrojejunostomy was done five days after the onset of the symptoms, was completely relieved of gastric symptoms but died sixteen days later from pneumonia. His 5 collected successful cases treated by operation include gastrojejunostomy by B. Robinson, 1 case by Moorehead for a large tumor in the abdominal cavity, which proved to be the distended stomach which was emptied by tube, 1 case by Petit in which a kinking at the duodenojejunal junction was relieved by stitching of the jejunum to the transverse mesocolon, a case by Sommarin, in which Witzel's gastrostomy was done the second day of the illness, a case by Templeton in which the greatly distended stomach emptied itself during operation without being incised or pumped.

Taking the above series of cases treated by operation as an example, it is evident that further operative procedure on these cases should be resorted to, if at all, only after every resource for treatment has been exhausted.

Of 26 cases collected and analyzed by Borchgrevink in which the stomach tube and the prone posture was used, 23 cases recovered. In 1 case that died, the treatment was first used the second day after the onset. The patient was relieved, but he died on the fifteenth day from intestinal hemorrhage; 1 case was promptly relieved by the treatment, but died twenty-two days later from pneumonia; in 1 case the abdominal posture was badly borne and the patient died the next day.

Borchgrevink also collected and analyzed 6 cases in which the patients were treated by the stomach-tube and side posture, 5 cases on the right side and 1 on the left. All cases recovered except 1.

The above cases as analyzed by Borchgrevink are indeed instructive. They certainly prove that the early use of

the stomach-tube combined with postural treatment will give gratifying and in some cases remarkable results.

My limited observation of the prone position has not been satisfactory. In my judgment this position is inconvenient and uncomfortable. I have not been able to get patients to maintain the position.

I have used the following treatment in my own cases:

1. The stomach-tube is inserted and the stomach is emptied of all contents and irrigated with normal salt solution until the water returns clear.

2. The patient is placed in the horizontal right latero-prone position. This position is in every way convenient and comfortable.

3. Continuous proctoclysis is given.

4. Everything by mouth is excluded until symptoms are entirely relieved.

5. Strychnin and spartein are given (strychnin, gr. $\frac{1}{60}$ or $\frac{1}{30}$, and spartein, gr. 2, every four hours).

6. If the patient is not prostrated and is nervous and restless, sufficient morphin is given to produce comfort and sleep.

With the above treatment some cases will have no further trouble. In others it may be necessary to repeat the washing of the stomach and morphin some four to twelve hours later. It should be repeated as often as indicated.

DISCUSSION

Dr. George A. Hendon, of Louisville, Kentucky.—This is certainly a practical subject for discussion. I read a paper with the same title before the Society at the Washington meeting two years ago, and in preparing that paper I learned so much about the subject that I have not seen a case of acute dilatation of the stomach since I wrote it. I learned the very important fact that if properly recognized and dealt with it is

unnecessary for us to have these very large accumulations of fluid. It has been my observation that when patients begin to show unfavorable symptoms within twenty-four hours after operation, that it cannot be explained in some easy way, they are due to a beginning dilatation of the stomach. The rule I have followed in treatment is the use of the stomach-tube as soon as the patient begins to grow unduly restless and in almost every case I have been rewarded with the siphonage of a small amount of this morbid secretion and by repeating the performance of lavage as often as the nervous condition seems to indicate, I have not had any of this trouble.

A great error which all of us make, and on account of which I lost a patient I am sure, is in waiting until the stomach becomes filled with toxic material and the patient begins to vomit before using the proper method for its relief. I am convinced of the fact that the dilatation of the stomach is not due to any anatomical condition or to any faulty arrangement of the stomach or intestine, and that it is toxic in origin, for the simple reason that we have the condition following operations on any part of the body. Cases of acute dilatation of the stomach are reported after club-foot operations. The worst case I have had except the one that died was one which followed a perineal section and cases have been reported in connection with pneumonia. I believe that the cause of it is as Dr. Morris has suggested, namely, a disturbance of the relationship between the secreting glands of the stomach and the hormones. The harmony of the hormones has been broken up and as a result there is a morbid secretion of the glands in the stomach which is controlled by the action of the hormones. I believe that the twist that we hear so much about of the duodenum is largely due to the distended stomach standing up and falling over at the root of the mesentery, and that it is the result and not the cause of the acute gastric dilatation.

Dr. Hogan (closing the discussion).—I am glad to have heard what Dr. Hendon has said on this subject. I hope I may have the good fortune that he has had since reading his paper on the subject at the Washington meeting. I want to emphasize the point that I believe we get an increase in mortality from this source. Members of our hospital staffs in operating on cases and turning them over to the interns, may return the next day to see the patients and find that they have not done well. This condition of acute dilatation of the

stomach may have developed and not have been detected. It may be the interns have just come in and are not familiar with the condition. Nurses may not have recognized the condition and the case has gone to the bad. I know of such cases. I believe when we recognize that this is a severe condition which may follow operations, and not only teach the house staff, but the nurses also to recognize the condition, to make proper notes, and the importance of prompt treatment, our mortality will be materially lessened. We will save patients who would otherwise die.

A NEW INSTRUMENT AND METHOD FOR REMOVING VARICOSE VEINS

By Mack Rogers, M.D.
Birmingham, Alabama

In discussing the subject of varicose veins, I wish first to call your attention to the profound impression that was made on me, as a medical student, by the heroic method of open dissection that was practised, for the radical cure of what seemed to me then, as such a superficial and unimportant condition.

Of course we were soon convinced of the gravity and importance of this disease, as well as the absolute necessity for thorough removal, or complete obliteration of these venous sinuses, in order to effect a permanent cure.

But I must confess that I have never been convinced that the very best method has yet been devised for accomplishing this purpose.

Although I believe that the instrument and method I am about to describe add another step in the right direction.

In presenting this instrument and specimen, I have purposely omitted all that does not directly pertain to my particular technique for removing a varicose vein.

In the use of this instrument, it is passed through the lumen of the vein, and the vessel is turned inside-out, on the handle of the probe, while the vein is being stripped from its tributaries and surrounding tissues, and the vessel is removed in one long continuous tube.

The instrument at first glance seems to be an ordinary

flexible probe, with a handle, but on examination we find that it is not flexible, but that it is rigid; this is in order that we may avoid the pockets and sinuses in the walls of the veins, and that we may follow more readily the tortuous course of its lumen.

We observe that just in front of the handle there is a distinct shoulder; this is to prevent the ligature from slipping back over the handle.

We also find that the handle is very small, so that it will pass more readily through the lumen of the vein.

A convenient set of these instruments is composed of two large, two medium, and two small sizes.

Such a set enables the operator to keep on continuously with his work, while the vein is being removed from the instrument that has been previously used.

Position. An ordinary gynecologic standard will afford elevation and support for the foot, with the leg extended.

This position renders the limb practically bloodless, and affords splendid accessibility to the field of operation.

Technique. A button-hole incision is made about two inches below the saphenous opening, transversely to the vessel.

The vein is now picked up, divided, and the proximal end is ligated and dropped back. The point of the instrument is now inserted into the lumen of the distal end of the vein and is gently passed down through the lumen of the vessel till the shoulder of the instrument meets the cut end of the vein, then a secure ligature is passed around the vein, near its cut end, causing it to embrace firmly the probe just in front of the shoulder.

The instrument is again passed down rather firmly, as far as the tissues around the shoulder or the obstructions in front of the point, will permit.

The point of the instrument is now forcibly elevated beneath the skin, and a second button-hole incision is made, the same as the first. The vein in the bottom of

this opening is again divided and the point of the instrument is forced out through this second incision and is caught by a pair of clamp forceps.

Now while the assistant supports the skin and subcutaneous tissues, on each side of the instrument, the operator, by successive backward and forward movements of the forceps holding the tip of the probe, will gradually strip off the tributaries and surrounding tissues, as the vein is turned inside out, on the handle of the instrument, as it is dragged down, through the lumen of the vessel, till it emerges from the second button-hole incision.

This process should be repeated till all vessels needing it have been removed.

Whatever hemorrhage may theoretically occur from the lacerated tributaries is controlled by their own elasticity and the pressure exerted by the hands of the assistant, on each side of the instrument, at the time.

I have never met with such a hemorrhage of any consequence or that gave me any concern.

The assistant may begin above, closing the button-hole incisions, by one or two stitches, while the operator is finishing his work in the foot. The wounds are then dressed in the ordinary way, and the whole limb is supported for several days by a snugly fitting bandage. The subsequent management of the case is the same as for all similar operations.

It must be obvious to all of us that this instrument and method is not adapted to all forms of varicose veins, but there are very few cases where it cannot be used to great advantage on some of the more favorable ones.

The vein not infrequently breaks before it can be entirely removed; this often occurs when the tributaries are unusually large and numerous. It also occurs in cases where the walls of the vessels have become thickened and adherent to the surrounding tissues, resulting from previous inflammatory processes.

When this break does occur, a new button-hole incision should be made at the point where the vein gave way, and another effort should be made to remove it.

If, however, we are not successful in this attempt, we should remember that permanent cure depends upon thorough removal, and therefore resort to open resection till we have removed this particular obstruction, and then return to the subcutaneous method.

By the use of this instrument and method for the last three years, I am now fully convinced that it has very greatly simplified this operation, reducing, as it does, to a minimum: (1) The time required to perform the operation; (2) the effort in doing so; (3) the amount of traumatism done the tissues; (4) the chances of infection; (5) the amount of scar tissue left behind; and (6) the time required for recovery.

INTESTINAL RESECTION; SUCCESSFUL REMOVAL OF MORE THAN TWELVE FEET OF BOWEL; WITH OBSERVATIONS ON THE SUBSEQUENT METABOLISM

By Raymond C. Turck, M.D.
Jacksonville, Florida

The following case is not brought to your attention because of its operative features, nor especially through a desire to record the successful removal of a relatively large amount of intestine, but rather to discuss certain dietetic problems and metabolic disturbances which, to a greater or lesser degree, are the annoying features in the after-treatment of such cases.

Summary of Case Record. J. H., white male, aged thirty-five years, was admitted to St. Luke's Hospital in December, 1912, suffering from partial intestinal obstruction, fecal fistula, a large suppurating wound in the right iliac region, with several loops of bowel incorporated in the scar and granulation tissue and multiple sinuses leading into the abdominal cavity; the result, primarily, of an appendiceal abscess with subsequent drainage, in 1904, and secondarily, nine operations—eight in New York and one in Jacksonville—for the relief of adhesions.

The patient was extremely neurotic, badly nourished, and had constant pain in the right iliac and umbilical regions. There was practically inevitable vomiting of food and drink, together with obstipation and an accompanying

distention that necessitated most stringent measures for even temporary relief.

First Operation. January 2, 1913, at St. Luke's Hospital; ether anesthesia. A long oval incision was made well out in healthy tissue. The peritoneum was opened beyond and on all sides of the adherent bowel, and the agglutinated mass, including the fecal fistulous tract and sinuses, together with the entire old wound, was packed off and delivered as far as possible.

Approximately ten feet of small intestine was involved. The adhesions were of every variety, ranging from the soft type, the result of the last operation, to old firm fibrous bands of several years' standing. There were numerous kinks, partial obstructions, and acute flexions. The cecum was contracted and intimately adherent to the mass of ileum. The fistulous opening was approximately seven feet from the ilioceal valve. The adhesions were, with some difficulty, entirely cleared. In view of the extensive raw areas, the sinuses and fistulous tracts and the probability of a recurrence of adhesive obstruction, it was decided to remove the lower ileum, together with the cecum and ascending colon rather than short-circuit the mass of bowel. During the clearing of the adhesions the old wound, with its scar and granulation tissue, was entirely removed. The ileum was divided well above the fistulous opening and mesenteric ligation begun. The patient, at this time, went into severe shock, which necessitated intravenous transfusion and other measures. The portion of ileum corresponding to the ligated mesentery was removed and an end-to-end anastomosis made with a Murphy button. The cecum was straightened out and attached to the lateral peritoneum. The wound was closed without drainage. The section of bowel was measured, without stretching, four hours after removal and was found to be three feet, two and a half inches in length.

The shock was severe for twenty-four hours. Patient

began passing flatus in forty-eight hours. The bowels moved freely after the fourth day. The wound showing signs of infection, was opened on the sixth day.

On January 29, 1913, the patient was in good condition; no vomiting; no pain; bowels moving freely; wound filling in; button not yet passed.

March 15, 1913. Under daily dressings the wound had gradually healed by granulation. The button, if passed, had been unobserved. The patient's bowels moved daily with cathartics or enemas. There had been for the past month great distention principally in the right side of the abdomen. Nausea and vomiting began early in February and continued at intervals. During March he vomited one or two meals each day. Upon exertion there was decided pain in the right side. A radiograph of the abdomen taken March 14, 1913, did not reveal the presence of the Murphy button.

The patient refused secondary operation, left the hospital, and attempted to work, but the nausea, pain, and distention returning acutely, he was readmitted. He had, however, gained in weight and was in fair general condition.

Second Operation. March 20, 1913, St. Luke's Hospital; ether anesthesia. A six-inch incision, an inch to the right of the median line, was made. The free peritoneal cavity was entered. The adhesions of omentum and bowel to the anterior abdominal wall at the site of the old scar were very dense and extremely extensive. A section of bowel about nine inches in length, evidently the site of the anastomosis, was immediately incorporated in the scar tissue of the old wound. The proximal free loop of ileum leading into the adherent mass of small intestine was ligated, divided, cauterized, and inverted by a purse-string suture immediately above the adhesion area. A lateral anastomosis was made between the ileum and the transverse colon with two rows of sutures, first a Connell suture of

No. 1 chromic gut and an outer reinforcing stitch of silk after Cushing's method. The adherent mass of small intestine was removed nearly to the iliocecal valve, when the patient again went into sudden and extreme shock, therefore it was not deemed advisable to remove the cecum and ascending colon. The lower end of the ileum was ligated, divided, and inverted after cauterization. The anastomosis was tacked to the anterior abdominal wall at the upper angle of the wound and the remaining raw surfaces covered as well as possible by bringing down the remains of the great omentum. A cigarette drain was inserted and the wound closed. The intestine was measured immediately after removal and was found to be seven feet, five and a half inches in length.

Recovery was satisfactory, though shock persisted for forty-eight hours. There was but little vomiting and no special distress. On the fifth day following operation he was given liquid nourishment by mouth; previously nourishment had been administered per rectum with most satisfactory results. The nourishment, consisting of four ounces of peptonized milk, the whites of three eggs well beaten, and two drams of whiskey, was given very slowly by the drop method, then nothing for four hours; then normal saline solution by the drop method for four hours, then nothing for four hours; then nourishment again and the cycle repeated.

On March 28, 1913, the old wound broke down with fecal discharge, evidently from a fistula of the cecum. The last wound healed kindly; the drainage came out clean; there was no evidence of leakage from the anastomosis or from the ligated bowel ends. During April there was a continuous variable fecal discharge from the fistula. Diarrhea was constant. There were from six to ten daily liquid bowel movements. The patient did not gain in general health or strength, though able to walk about.

May 13, 1913, fecal fistula entirely closed; both wounds

apparently sound; patient markedly neurasthenic; bowels moving from five to eight times daily; occasional vomiting. Refused further operation and returned to his home in New York.

June 20, 1913. Patient wired that his old wound had again opened with discharge of large amount of fecal matter; that he was in very bad condition, having numerous bowel movements and severe vomiting. He refused operation in New York and returned to Jacksonville.

He arrived apparently in good general condition, but was extremely neurotic, was vomiting intermittently, and having from six to ten bowel movements daily.

He was returned to St. Luke's Hospital, where he was observed and treated by Dr. Graham Henson, with marked improvement, so much so that he refused further operation and again returned to his home in New York city. Soon after his arrival there all symptoms increased and he was obliged to enter a hospital for treatment. He again refused operation, and in November returned to Jacksonville. There was at this time a marked ventral hernia at the site of the old wound, but with no sinus or fistulous tract. An extremely dilated hepatic flexure was readily demonstrated. Believing that fecal stasis in the blind pouch, consisting of the cecum, ascending colon, and hepatic flexure, was causing his vomiting, abdominal distress, and possibly his neurasthenia, he was again admitted to St. Luke's Hospital.

Third Operation. November 17, 1913, St. Luke's Hospital; ether anesthesia. The old scar was dissected out. The anastomosis was found to be in excellent condition and free from adhesions. There was a decided enlargement and an apparent hypertrophy of the small intestine above the anastomosis as far as examined. The hepatic flexure and ascending colon were greatly dilated and filled with fecal matter. The transverse colon was ligated, divided, cauterized and inverted immediately below the anastomosis. The

colon was then removed from this point back through and including the cecum and stump of the ileum, thus completing the removal of all intestine outside the anastomotic short-circuit. The removed colon was straightened out without tension and was found to be $15\frac{1}{4}$ inches in length. The stump of the ileum measured $2\frac{3}{4}$ inches exclusive of the inverted portion. The wound was closed by imbricating the fascia. There was apparently no shock from this operation. Recovery was satisfactory except for a moderate dilatation of the stomach, which was readily controlled.

December 1, 1913. Patient on full diet; bowels moving without difficulty; sitting up in bed.

So far as the length of the resected bowel is concerned, there was removed 10 feet, $10\frac{3}{4}$ inches (332+ cm.) of the lower portion of the ileum, and 1 foot, $3\frac{1}{4}$ inches (38+ cm.) of colon, making a total removal of 12 feet, 2 inches (371 cm.).

Attention is called to the fact that this bowel was measured under the most unfavorable circumstances; that is, along the mesenteric border and after it had been removed. According to McGuire, there is decided longitudinal shrinking of the intestine after removal. Therefore it is probable that had this bowel been measured before removal the length of resected ileum would have exceeded 11 feet. However, in view of the fact that, as Monks has demonstrated, the human small intestine varies from 15 to 25 feet in length, and further, since severe metabolic disturbances have followed the removal of relatively small amounts of intestine, while cases of very extensive resection have shown no disturbance whatever, it would appear that the removal of a few inches or indeed a few feet, more or less, is a matter of no special scientific interest, unless there can be shown in that particular individual the total length of small intestine. It is certainly reasonable to presume that the removal of 8 feet of intestine from a patient having a

total of but 15 feet would have a very much greater effect upon the digestive and assimilative functions than the removal of 12 feet from a patient having a total bowel length of twenty-five feet. Therefore it would not seem possible to lay down an absolute rule as to the amount of intestine that may safely be removed. According to Flint ("The Effect of Extensive Resection of the Small Intestine," by J. M. Flint, M.D., John Hopkins Hospital Bulletin, May, 1912), whose most excellent work on this subject is deserving of more than passing mention, it seems safe to assume that not more than one-half of the human small intestine may be removed without serious metabolic disturbance and actual danger, though "the resection of smaller amounts may, however, be followed by severe metabolic disturbances, and even inanition and death." Flint further states: "If we are justified in generalizing from these cases, we may say that there is not great danger in removing as much as 275 cm. of the small intestine, but beyond that limit death from marasmus may occur." As to whether it is safer to remove large sections of the intestine from the upper or lower portion of the tract, the literature is most conflicting. Accepting the hypothesis that absorption takes place largely in the ileum, and that the true intestinal or pancreatic digestion occurs principally in the jejunum, it would seem that the greatest amount of intestine might be removed with safety from the central portion of the tract, and that as much as possible of the lower ileum and upper jejunum should be left in place.

Fantino's suggestion, that in cases of extensive resection a vicious circle be established in the remaining segment of bowel, that the intestinal contents may circulate long enough to complete the digestive and assimilative processes, seems worthy of consideration and trial.

A review of the literature and a study of case histories points plainly to the fact that, from the view-point of ultimate results, short-circuiting, whenever possible, is

much to be preferred to resection, particularly if the lower ileum be involved.

In the case reported above, while circuiting was decided against at the time of operation, because of the indescribable adhesions, the foul sinuses and fistulous tracts, it is probable that a better ultimate result would have been attained had the worst segments been removed, and the remaining adherent gut short-circuited in one or two places. This patient certainly has not enough small intestine to permit of thorough absorption, though compensatory intestinal hyperplasia provides adequate digestion.

In the after-treatment of this patient, as in other similar cases, we were working at a disadvantage because we were singularly lacking in definite data as to how or what to feed these patients to prevent the distressing diarrhea as well as the early or late malnutrition which so often follows. Observers have stated that these cases do about as well on general as on special diets. Flint has concluded from his own experiments and from the study of the work of others that: "The diet in these cases should be rich and easily assimilated, but it should not contain too great a percentage of fats. The complete utilization of the carbohydrates suggests the advisability of increasing these elements of the food."

Since this case involved the removal of almost the entire ileum, studies of this patient's metabolism should be of some interest and value.

The case was referred to Dr. Graham E. Henson, of Jacksonville, who is making studies in the metabolism, and as a result of his preliminary investigations has devised a system of feeding which is giving most satisfactory results. Dr. Henson has summarized the medical and physiological aspects of this case as follows:

"The patient first came under the writer's observation in July of the present year. His hospital record previous to this time may be divided in two periods—one in which he

received the regular hospital diet with no medication, the other in which on the same diet he received astringents and intestinal digestive ferments. During the first the average number of stools was 6.4 per diem, for the second period, 6.3—demonstrating the fact that medication did not relieve his diarrhea to the slightest degree. Beginning July 26, an attempt was made to regulate his diet and a study of his metabolism anticipated with a view of ascertaining, if possible, the diet most suited to his needs.

"The following table shows the average number of stools per diem under a variety of restricted diets:

TABLE I

Special diet.	Average number of stools per diem.
Chicken, roast beef, toast and cereals	5.00
Oat meal, sugar and milk	4.25
Irish potatoes, oat meal, sugar, and milk	4.00
Regular hospital diet, excluding all meats	3.66
Hospital soft diet	3.00

"The patient deserted a few weeks after these observations were commenced and before any attempt was made to study his metabolism.

"Reëntering the hospital November 17, he again came under the writer's observation on December 5, having been on the regular hospital diet for several preceding days. Upon this date the first examination of his feces was conducted, resulting in the following findings: Stool, fluid quantity, 700 grams; color, light yellow; odor, not specially offensive. Reaction, acid to both litmus and phenolphthalein. Chemical tests for starch, erythrodextrin, sugar and occult blood were all negative; for mucin, only slightly positive. The stool, macroscopically, showed a moderate lientery, which upon microscopic examination, was found to be due to an aztorrhea. The fibers were mostly digested to the point that the transverse striations and nuclei were not shown, but in some both longitudinal and transverse

striations could be observed. Steatorrhea not present, nor were crystals of any form in excess.

"On December 8 the patient was placed on the following diet:

	Grams.	Albumin, per cent.	Fat, per cent.	Carbohydrates, per cent.	Calories.
Zwiebach . . .	100.00	8.00	1.00	75.00	349.60
Toast	200.00	14.00	1.00	110.00	517.70
Potatoes . . .	192.00	2.60	....	38.40	168.10
Eggs (4) . . .	.....	28.20	22.00	.....	320.92
Butter	30.00	.....	23.00	.....	214.66
Cream	128.00	4.62	34.24	4.50	356.95
Milk	256.00	8.96	6.40	9.98	137.37
Sugar	40.00	0.14	.....	37.33	164.00
	946.00	66.52	87.64	275.21	2229.30

Weight of patient, 63 kilos
35 food grams to kilo = 2205 = required calories at rest.

"It is worthy of note that during all preceding periods in which his urine was examined for indican that this constituent was constantly and markedly in excess, but that two days after being on the above diet the indicanuria almost entirely disappeared. While on the diet tabulated his average urinary output was 456 c.c. per diem, the specific gravity of a twenty-four-hour specimen was 1.028, the total urea out-put in the twenty-four hours was 7.84 grams. His stools following the use of this diet average three per diem. The feces within a short time became semiformed, with an average weight per diem of 755.2 grams. There were no chemical or microscopic findings differing from what had already been recorded while the patient was on the regular diet with the exception, of course, that azotorrhea was not present. Further tests for starch, erythrodextrin, and for sugar were all negative. In this case it would seem probable that a compensatory hyperplasia of the small intestine and a compensatory production of the ferment enterokinase was at least commenced. We know that amylopsin and steapsin are capable of exercising their

functions with little auxiliary aid from enterokinase, but that trypsin is dependent very largely on auxiliary aid from this ferment. It is reasonable, therefore, to presume that the compensatory production of enterokinase in this patient has reached the point where, together with the enzymes of the pancreatic juice, it is sufficient to digest partly the intake of carbohydrates and fats, but that this compensatory production has not reached the point of producing sufficiently to digest proteids thoroughly.

"For the purpose of demonstrating to what extent the absorbability of the intestine is interfered with, Sahli's method was tried, the patient being given 0.15 gram of iodoform in a salol-coated gelatin capsule with an Ewald test-meal. The appearance of the iodine reaction in the saliva on two different occasions was delayed six hours, hourly tests being conducted.

"A blood-examination showed:

Total red cells	4,700,000
White cells	9,800
Hemaglobin (color index)	75

Differential Count

Polynuclear neutrophiles	77.8
Small lymphocytes	15.4
Large lymphocytes	3.6
Large mononuclears	2.0
Eosinophiles	1.2
	100.0

Arneth Count

1	2	3	4	5
12.50	34.00	44.50	7.00	2.00

Shift to the left of 6.50

"The writer fully realizes that the studies in this individual are far from complete—in fact, hardly more than commenced, but it is hoped later to be able to present the results of a more detailed metabolic study."

CATGUT AS A SKIN SUTURE

By William Perrin Nicolson, M.D.
Atlanta, Georgia

The evolution and development of a surgical technique results from the combined experience of many men, changed from time to time as the views and methods of individual operators are tested in the crucible of clinical practice, and adopted, modified, or rejected. All are desirous of attaining what is best and that which contributes to the comfort and safety of the patient.

In no field has there been greater activity than in the care and handling of the skin in its preparation before and its treatment during operation, as well as its closure afterward. The marked trend has been toward simplicity of method. The question of the absorbable or non-absorbable suture has been much and vigorously discussed, and there has been a tendency upon the part of surgeons to eschew catgut.

The object of this short essay is to record the experience of the writer in the use of absorbable sutures, in order that it may contribute, however feebly, to draw attention to its many valuable features. No attempt will be made to present an argument based upon scientific bacteriological investigation, but only to draw attention to clinical results.

I have been for many years a consistent believer in the use of catgut sutures, to the exclusion practically of all others, except in intestinal work, and in that time have tested this method in its various aspects thoroughly. The

premise will be accepted by everyone that the ideal wound course is where it is made under aseptic conditions, closed with a suture that will be disposed of by the tissues, and allowed to remain under its first dressing until complete healing has taken place. Under such circumstances, if no contamination has taken place at the time of operation, none can occur under the undisturbed dressing, while the converse is equally true that whenever exposure of the wound is made by change of dressings, bacteria may be admitted and infection take place. The withdrawing of a stitch at this time through the deeper tissues may result in deep infection. Such ideal wound healing can only be attained by the use of catgut.

The objections to the use of absorbable suture may in the final analysis be reduced to two, viz.: (1) That the organic material may prove a suitable culture medium for the bacteria buried in the skin, and result in wound infection and a stitch abscess. (2) That absorption may be too rapid, and the edges of the wound be permitted to gap before complete union has taken place. It is my opinion that both of these can be safely eliminated. In a paper presented a number of years ago (*Transactions of the Medical Association of Georgia*), I advanced the claim that catgut became a safe suture just in proportion as skin disinfection stops short of skin traumatism, and the present tendency to simplicity of preparation bears out this claim. A skin that is scrubbed, scraped, washed, and soaked in strong chemicals is not in shape to take care of any kind of suture. Gentle washing of soap and water and alcohol, and when perfectly dry, painting with tincture of iodine, seems to be the ideal method, as seen at present. Perhaps a dry shave and application of tincture of iodine on the table gives practically the same results. This application I make upon the operating table, after which washing away the iodine with alcohol. I mention this because it is claimed by many that iodine should be applied some time before the patient

reaches the operating table. Hundreds of cases have demonstrated that two minutes is clinically long enough, even though it may not be theoretically so. Skin thus prepared will handle catgut without trouble, provided the proper size is employed in the proper manner. The second objection can be met by using chromic catgut, and after trying various sizes I have for the past two years employed the No. 00 chromic practically exclusively. This is smaller than almost any other suture, and at the same time has enough tensile strength to hold the edges of the wound in coaptation. It should be remembered that skin sutures are for coaptation, and not for resisting strain, and should there be unusual strain, as in breast amputations and removal of growths, there should be relaxation sutures, and perhaps a little larger chromic for the skin edges. The No. 00 chromic suture will resist absorption in the skin for from seven to ten days without irritation or reddening.

Much depends upon the manner of placing catgut sutures. They should not be too closely placed or too tightly tied. Personally, I much prefer the continuous running suture, passing somewhat deeply into the subcutaneous fat, and taken at intervals of from one-half to three-fourths of an inch. Such a wound can be made to lie in perfect apposition, and at the same time can be pulled apart at any point, thus allowing free drainage by direct transudation between the wound edges. The serum thus exuded in drying out in the gauze makes an ideal splint for supporting the wound and should not be disturbed until healing is complete. Blood-serum dried thus in the gauze makes a dressing practically impervious to air and water. With the exception of supporting sutures in abdominal incisions, all wounds in my experience for years have been closed thus with catgut. The deeper layers in abdominal incisions are usually brought together with the No. 00 chromic, used in two strands, or a little larger size. In no wound does catgut behave more satisfactorily than in those in the

scalp, though many have contended that it should not be done. In extensive incisions for operations upon the brain, it has been my practise for years to use the continuous catgut suture, which does away with the necessity for ligating vessels in the scalp, and at the same time permitting them to close perfectly under one dressing. In hernias, kangaroo tendon is used in the deeper layers, and catgut in the skin. The extensive suture lines of breast amputations are closed with catgut, and the dressing usually removed from the sixth to the eighth day, for the purpose of removing drainage tubes, in which time but little further dressing is required. Even scrotal incisions in varicocele receive the same treatment.

In conclusion, we may ask, how much does it mean to the patient to know that no stitches have to be removed, no dressings to be changed, and that after once in bed from the operating table, there are no more harrowing or disturbing processes to be put through, and in the end it means much less work for the surgeon, much less dressings for the hospital, and an ideal result.

DISCUSSION

Dr. J. Shelton Horsley, of Richmond, Virginia.—It does not make much difference whether we use silkworm-gut or catgut. The results are just as good from the use of catgut, and personally I use it.

Dr. A. C. Scott, of Temple, Texas.—I do not know just what to say in reference to catgut in the skin. I do not use it. It reminds me, however, of the suture we have been using for some time which has given us rather good results, and that is the use of a continuous suture of silkworm-gut without tying any knots in it at all at either end. By starting in with a forceps attached to the end of the suture after the first stitch is made, just as we take the skin, the forceps is picked up and carried around the sutured end which is attached to the needle, and we go on with a continuous suture to the other end, the

advantage being that if we find we have been in a hurry, or careless, or if we have failed to appreciate just how tight we were getting it, we can go back and loosen it up at any particular place. Aside from getting reasonably accurate apposition of the skin the important thing is not to have much tension. You have stood about and have heard some of the best men caution you against the use of tight sutures and at the moment they are telling you the sutures ought not to be put in tightly, some of them tie them too tightly. That is a common thing. It depends largely on what the operator is thinking about and the condition of his temper at the particular moment. When I have not been operating for several days, or for some little time, especially when I return from a vacation, I have discovered that I break more ligatures than I do ordinarily for the reason that I am unaccustomed for the time being to feel just how tightly I am tying my ligatures. And it is a common thing the first day I operate, when I have not been operating for some time, to regulate the ligatures, to get them tight enough and not too tight. The same thing applies in suturing the skin. When we tie our sutures we get them too tight and others not tight enough.

Dr. Francis Reder, of St. Louis, Missouri.—The inference I gather from the paper of Dr. Nicolson is that he uses catgut to relieve the mental anxiety of his patients. That is a pleasant attitude because so many patients dread the taking out of sutures. As a skin suture I have found other suture material more to my liking. As a subcutaneous suture a number one plain catgut has served me excellently. In the sewing of wounds in children a catgut suture is abbreviated by the surgeon. I invariably use it in scalp wounds in children, and have never had any untoward results.

Dr. Nicolson (closing the discussion).—With regard to the remarks about the feelings of the patients, you accomplish something if you can do away with the fear that patients have of removal of stitches. This is notably so in children.

I saw recently a gentleman closing a long scalp wound in a little child with closely placed silkworm-gut sutures. If that same result in the end can be obtained by a suture that does not have to be taken out and accomplishes the same amount of good, the child is better off. Of course, there is a wide difference of opinion about the results of catgut. It may be the long use of it has given me confidence. I do not get any trouble from

it. If you use fine catgut it is absorbed in plenty of time, and I would not think of putting catgut alone through and through in the abdomen. I use silkworm-gut, and where it is closed in layers by catgut, it is supported outside the line of suture by silkworm-gut in case anything should happen to the catgut.

In reference to Dr. Scott's continuous silkworm-gut suture, I am satisfied he can get the same result exactly with the small chromic catgut suture that has not to be taken out. It is simply a question as to whether the same efficiency can result from the catgut as from the other. An ideal condition certainly is one in which the wound is closed and never opened, because nothing can happen to it if that is true. I saw a death in the earlier days of appendix operations, where a through-and-through silkworm-gut suture was removed; the patient got an infection from which general peritonitis took place. I do not think it would take place at this time, yet all these things are possibilities. When a wound is open and exposed to the touch of the hands or instruments, or air, there is danger, and I believe anyone who will use fine chromic catgut, which is almost finer than any stitch, finer than horsehair, as fine as the finest silk, will find that it produces no irritation.

I never use catgut that contains a chemical substance for the purpose of sterilization. The catgut sutures the manufacturers put up have mercuric salts in them, the biniodid or bichlorid of mercury, or the iodin, will sometimes produce irritation in the skin, each one of the needle punctures having a red circle about it. I never find that with catgut that is sterilized purely by heat. Catgut that is chromicized and has a definite time for its absorption in the muscular tissue, say twenty days, will be absorbed in the skin in something like seven to eight or nine days, giving it ample time, and I believe anyone who will try it, especially with the present method of disinfecting the skin, will find it satisfactory. The skin was so traumatized by scrubbing and shaving and washing many years ago, that it was not in shape to take care of any kind of suture, and the resisting power of the skin was destroyed, and we got infection from it time and again.

The point raised by not having the sutures too tight or close together, is one that should be watched most carefully.

EXPERIENCES WITH A METHOD OF IMMEDIATE REPAIR OF PERINEAL LACERATIONS

By Greer Baughman, M.D.
Richmond, Virginia

In spite of Dr. Karl Hegar's idea that immediate repair of the perineum is of very little importance and that binding the legs together in a large part of cases is sufficient, most of the obstetricians agree that the immediate repair of perineal lacerations, no matter how slight, should be insisted upon. The fact that immediate repair of perineal lacerations does not give uniformly good results is no argument against making the attempt, because there is no procedure that can be performed by a surgeon that gets uniformly good results.

In my work I must confess that the results of sewing the perineum according to the methods usually employed have not met with brilliant success. Since I have adopted the plan of procedure that I am now using and have used for several years in the past, which I call "the Robins method," after Dr. Charles R. Robins, who devised the plan, my results have been good in almost every instance.

While I have tried a good many different methods I have never tried the method suggested by Charles Jewett, A. L. Smith, and A. Sturndorf, namely, the placing of sutures of silkworm gut in the perineum before it is torn and then removing them if the perineum does not tear, nor have I tried the methods suggested by Dr. Brook N. Anspach, of

using buried sutures of catgut in the muscles of the vagina, in which he reported 200 cases that have recovered without trouble.

Bernhard Schutte reported from the Frauen Klinik, Berlin, upon 14,200 deliveries from January 1, 1905, to January 1, 1910, that 2671, 18.5 per cent., had a tear of some sort. 1863 had first-degree tears, 704 had second-degree tears, 24 had third-degree tears.

From April 1, 1905, to April 6, 1906, of the 370 tears, 352 healed by first intention, 18 healed by second intention. All of these tears were repaired immediately after they happened, the vaginal portion being sutured with catgut, the perineal portion being sutured with silkworm gut and afterward powdered with iodoform.

In 1909 the outside perineal portion was sewed with Michelschen clamps. Of the 127, 125 healed by first intention. The inside was sewed with silk or wire.

Bucura reports from Krobach's clinic in 1901 there were 3333 births. There were 313 tears sewed that healed:

		No fever.	Light fever.	Fever.
By first intention . . .	279 or 89.2 % of these	269	5	3
Sutures cutaneous by primary	2 or 0.6 % of these	1		1
Part by primary . . .	14 or 4.5 % of these	13		1
Secondary	18 or 5.7 % of these	7	3	7

J. Eversman sews up the patients while lying on their side. He never needs to use an anesthetic. If this be true, he certainly does not have the class of women to deal with that I have encountered, because I have found very few that would lie sufficiently still to be sewed up properly without the use of an anesthetic. He pulls the buttocks over the edge of the bed. One thigh and buttock is pulled up by an assistant; he uses a lysol solution on the wound, first cutting off loose tags, then places sutures into the skin down behind the end of the tear back out on the oppo-

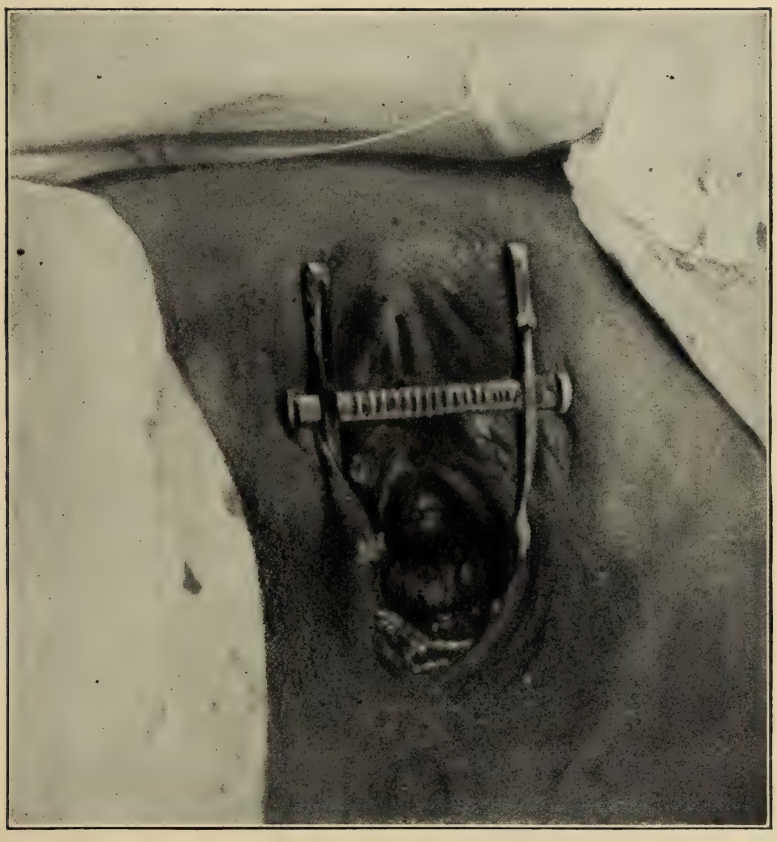

FIG. 1.—Speculum in place showing tear

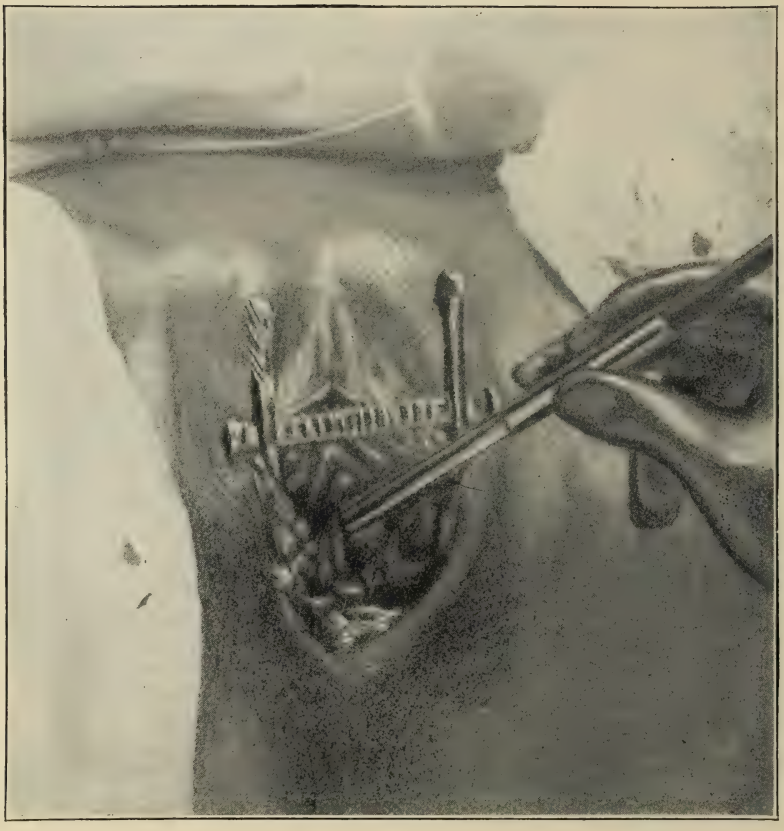

Fig. 2.—The forceps grasping the highest point of the tear.

FIG. 3.—Catgut suture introduced at the highest point of the tear in the left sulcus.

FIG. 4.—The left sulcus completely repaired, mucous membrane and fascia having been brought together with a continuous catgut suture.

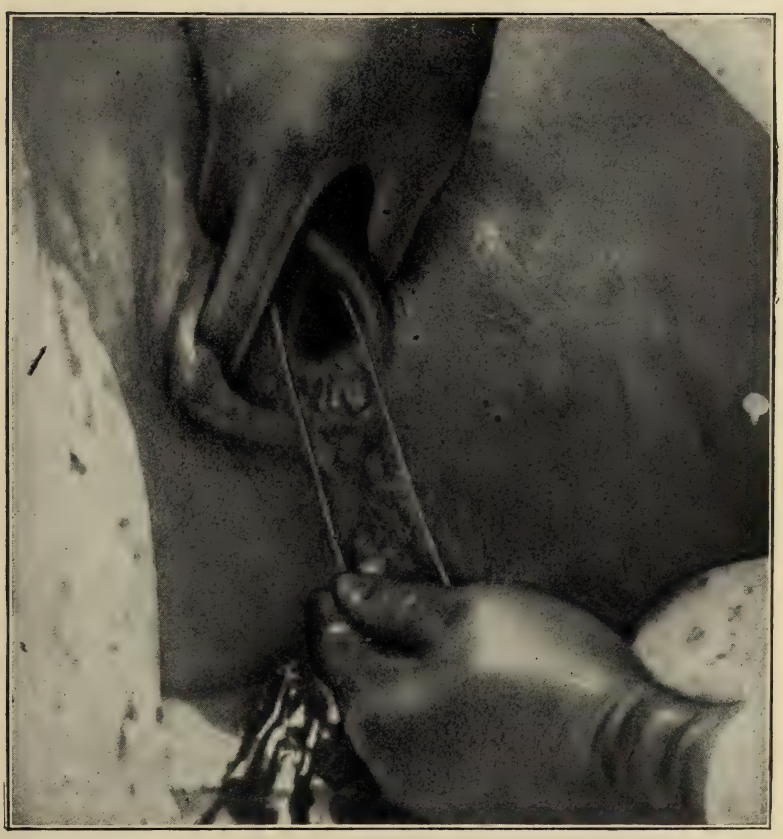

Fig. 5.—Continuous catgut suture completed for both sulci.

FIG. 6.—The insertion of the needle from the skin surface through the muscles to the highest point of the sulcus of the left side to the highest point of the sulcus on the right into the muscles out through the skin on the left. Needle is then threaded with silkworm gut and withdrawn.

FIG. 7.—The vagina and perineum after the crown sutures of silkworm gut have been introduced and after the skin has been united with one of the continuous catgut sutures from the left sulci, the catgut suture of the right sulcus having been tied and cut.

site side. His idea is to get behind and below the tear, so there will be no reservoir for holding lochia. He uses silkworm gut and advises the surgeon not to put his fingers in the wound. In 1040 cases delivered 59 had tears of the first degree. All got well. There were 86 of the second degree. One had a bad result with the fever. 28.6 per cent. of those that tore had tears of the third degree with one bad result.

Dr. J. Milton Mabbott idea is that the perineal sutures over the skin surfaces might be put in such a fashion that the greatest distance should be at the side of the tear. He introduces the suture in the skin surface and then passes it toward the ischial spines, taking in a large quantity of muscle with the sweep of his needle in order that when the sutures are drawn, the greatest pressure will be over the point at the greatest distance and in consequence the wound is held tightly together at the sides.

The plan devised by Dr. Chas. R. Robins in 1909 is as follows:

The procedure is simple; the most important things to consider are a good light and a good exposure of the torn area.

The patient is placed on her back with the thighs flexed on the abdomen and held in place with a suitable support like the Robb-Kelly strap. The vagina is cleansed of clots and the upper part of the vagina packed with sterile gauze or cotton, so as to make the field of operation as bloodless as possible. Then a good light is thrown into the vagina. It is essential for the operator to see what he is doing because the parts are so distorted and bruised that it requires some discrimination to be able to recognize what parts belong together. Robins recommends sewing the mucous membrane and submucous fascia of the vagina to the mucous membrane and submucous fascia of the opposite side of the tear with a continuous chromicized catgut suture. Care must be taken not to catch the muscles with the suture.

The suture begins at the upper part of the tear in the vagina, and is continued down toward the vulva, uniting the mucous membrane and fascia with a continuous running suture, the operator trying to match the part of one side to that from which it has been torn. This restores the shape of the vagina (the vaginal sheath). After the vulva has been reached the suture and needle are laid in the vagina to be used later to unite the skin with a continuous suture. If there happens to be another tear in the vaginal sulcus or median line, which is almost always the case after the use of forceps, that tear is sewed, the mucous membrane and fascia to the mucous membrane and fascia of the opposite side, and when the vulva is reached, the suture is temporarily laid aside.

Then the crown sutures of silkworm gut are put in from the skin surface just as is usually done, slanting downward and backward; but the rectum should not be entered, as sometimes happens, unless one introduces in the rectum a gloved finger. It is well to pull the wound well forward with the sutures before tying, to see that the perineum is well cared for; then they are tied. The catgut suture that was stopped at the opening of the vulva is then picked up, with a continuous suture the denuded surfaces are brought into apposition and the suture continued down the skin.

If the rectum has been torn, the sphincter ani may be caught and brought together by a silkworm-gut suture, introduced in the skin just above the rectum, passing through the muscle and out at the other side through the skin. A similar suture just above the mucous membrane of the rectum, introduced from the skin, passing around the tear in the rectum and coming out on the skin of the opposite side, will draw the mucous membrane down like a purse string.

When the sewing is aided by a good light the result is well-nigh perfect.

The continuous suture brings the denuded and torn sur-

faces so close together that there is no seeping of lochia or of infectious material and the muscle sutures have a chance to hold.

The distribution of perineal tears and the bearing upon instrumental delivery in producing perineal tears in 158 delivered among private cases was as follows:

Primiparæ	80	in number
Instrumental deliveries	19 or 23.95	per cent.
Tears with instrument	12 or 63.78	"
Deliveries without instrument	61 or 76.05	"
Tears without instrument	4 or 6.00	"
Multiparæ	78	in number
Instrumental deliveries	8 or 10.25	per cent.
Tears with instrument	2 or 25.00	"
Deliveries without instrument	70 or 87.65	"
Tears without instrument	3 or 4.28	"
Total number of cases delivered with instrument	27 or 17.08	per cent.
Total number of tears with instrument	14 or 15.85	"
Total number of cases delivered without instrument	131 or 83.00	"
Total number of cases torn without instruments	7 or 5.00	"
Total number of tears in series of all delivered including those delivered with instruments	21 or 13.29	"

The tears were distributed as follows:

Tears of first degree	9
Tears of second degree	11
Tears of third degree	1

In the series sewed by the Robin's method all of the first degree healed perfectly, all of the second degree healed by first intention except one, and that was in the case of the most intractable woman that it has been my misfortune to attend. The third degree tear healed only partly. She has entire control of her feces but a bad rectocele and she should be operated upon for the relief of this condition.

Olshausen reported unavoidable tears of the perineum in primiparæ in 15 per cent. of his cases.

Schroeder reports that great care must be taken in primiparæ to have as small as 15 or 20 per cent. of tears.

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BONE-PLATING: WITH REPORT OF CASES

By George A. Hendon, M.D.
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The first was for a fracture of the femur at the junction of the middle and upper third, and had occurred five years previous. The recovery took place with about three inches overlapping and non-union, in consequence of which a false joint existed. A month before admission the man was knocked down and trampled upon in a fight. The ligamentous formation of the pseudo-arthrosis was broken. The subject of this report was a negroman, aged thirty years, with very low mental development even for a negro. An operation with the Lane plate was undertaken. The site of the fracture was exposed through a long incision upon the external lateral aspect of the thigh. The fragments of bone were found overlapped and separated laterally as much as four inches, a large cushion of muscle and fascia intervening. The strongest impression I had from this case was made by the extent of lateral separation as compared with the overlapping of the fragments. In fact the fragments could not be accurately described as being overlapped because they did not touch each other at any point. The ligament joining the two ends was composed chiefly of thickened periosteum, with some bone deposits in its substance, sparsely situated. The ends of the bones were sawed square and the plate fastened in position. The wound in the soft parts was closed with a single layer of deeply

situated silkworm gut. The patient was given a Buck extension with a five-pound weight attached to make him lie quietly.

Affairs progressed favorably until three weeks had elapsed, when suppuration manifested itself. The wound was opened and irrigated daily. At the end of eight weeks the plate was removed and bony union seemed at that time well formed. After four more weeks I am informed by Dr. Zimmerman, who succeeded me in the ward, that the union had since been dissolved.

The next case was one of compound fractures of both tibiæ and fibulæ, resulting from an automobile accident. The limbs were dressed in plaster of Paris, with openings over the wound in the soft parts. At the end of three weeks this dressing on the left leg was removed and no union had taken place. A Lane plate was applied at the operation. We were much surprised at the lateral separation of the fragments and the amount of muscle and fascia intervening. The ends were squared and fastened with a plate. One week later the opposite limb was treated in the same way. While both fibulæ were involved only the tibiæ were plated. The results in this case were ideal. No form of fixed dressing was used. The limbs were laid upon pillows. The wounds healed by first intention and the plates so far have not given any trouble.

The next case was patient No. 3 and operation No. 4. A boy, aged seventeen years, suffered a fracture of the lower third of the tibia caused in jumping over a ditch. The deformity was much greater than one usually sees in such cases and could not be reduced. The *x*-ray machine being out of commission at the hospital, no radiograph could be taken. The fracture was exposed for plating, when the reason of the unreasonable deformity was plain. Both leg-bones were broken, the fibula was wrapped once around the tibia, the lower end of the upper fragment of the fibula presenting upon the inner side of the tibial shaft.

There was considerable lateral displacement. The upper end of the lower fragment of the tibia was buried in the muscles of the calf. The ends were sawed smooth and plated. This boy got out of bed the night after the operation and stood on the broken leg, with the result that it bowed backward. He refused to have it corrected and expressed himself as satisfied with his condition. Up to last accounts his plate had given no trouble.

The fourth patient and fifth operation was in a man who sustained a fracture at the junction of the lower and middle third of the tibia. After eight weeks in plaster of Paris the fracture seemed to be united and there was no deformity, but after placing a little weight upon the leg it began to bend with the convexity outward and caused him great pain. Plating was proposed and accepted. Exposure of the fracture showed lateral displacement and ligamentous connection. The ends of the fragment were squared and plated. The result was all that could be desired. Up to now the plate has given no trouble.

The next case was a compound fracture of the middle third of the tibia, which became infected. The case was treated in a fenestrated plaster cast for about eight weeks. The wound in the soft parts healed down to a small sinus that would scarcely admit a knitting needle and it was thought all the infection was overcome. No union of bone was apparent. Plating was advised and accepted. The limb was prepared and the sinus wiped out with iodine the day before. As the internal aspect of the limb had been the site of trauma and the skin was thin and delicate the incision was made upon the outer surface and the bone was exposed through the interosseous space. This proved a serious error, as considerable hemorrhage was encountered and controlled with great difficulty. The fragments were found overlapping and without osseous union. Plating was done. The case was infected either from a hematoma that formed in consequence of imperfect hematosis or

from the sinus remaining after the original injury. The plate had to be removed four weeks later and a splint applied.

The next case was one of comminuted fracture of the tibia with injuries of the thorax, the exact nature of which were not determined. The man died forty-eight hours after the operation, presumably from his internal injuries. He also had a broken clavicle, which was not plated.

OBSERVATIONS ON THE TREATMENT OF TRIGEMINAL NEURALGIA BY DEEP INTRANEURAL INJECTIONS FOR ANESTHETIC AND THERAPEUTIC PURPOSES

WITH SPECIAL REFERENCE TO THE METHODS OF REACHING THE GANGLION AND NERVE TRUNKS AT THE BASAL FORAMINA. TECHNIQUE DESCRIBED WITH LANTERN SLIDES

(Abstract)

By Rudolph Matas, M.D.
New Orleans, Louisiana

The speaker considered the subject from the double point of view: (1) Analgesia of the territory sensitized by the trigeminus, for purely surgical purposes; (2) analgesia of the trigeminus for the relief of neuralgia. He recalled his pioneer efforts as early as 1889, when working with regional anesthesia, he succeeded in anesthetizing the second division of the fifth nerve at both foramina rotunda by injecting the trunk of the nerve at its exit from the foramen, and obtained sufficient anesthesia to permit of a complete excision of both upper maxillæ for an extensive carcinoma of the upper jaw and palate. Both upper maxillæ were excised at the same sitting. Prior to this time, he had performed several operations on the jaws by reaching the nerve trunk at the foramen rotundum through the infra-

malar route which has since been associated with his name, and is practically the route subsequently adopted by Schlosser for the introduction of alcohol into the nerve at its exit from the foramen. But in this particular instance, he injected the nerve at the foramen rotundum through the orbit by the route of the sphenomaxillary fissure, filling the sphenopalatine fossa with a cocain solution so as to obtain a complete anesthesia of the second division and Meckel's ganglion with all its branches.

This is the route that by a mistaken impression is credited to Payr and which Härtel has recently extolled as the most direct and satisfactory way of reaching the foramen ovale.

He also resorted to the lateral inframalar route, to reach the foramen ovale and thus controlled, by the two methods, the area supplied by the second and third divisions. The results obtained in several cases of resection of the lower jaw for malignant disease were exhibited in lantern slides. The results in all these cases were quite satisfactory from the analgesic and operative point of view.

Since the introduction of intraneural injections of osmic acid by Neuber, and especially of alcohol by Schlosser in 1907, he has devoted special attention to the technique of injecting the nerve trunks for the relief of tic douloureux. More recently, however, he had gone a step further by attacking the Gasserian ganglion itself.

He reviewed the various routes advocated by Schlosser, Ostwaldt, Wright, Levy and Boudouin, Sicard, Taptas, Braun, Offerhaus, and Härtel, and especially his experience in the last method, which he had practised considerably during the past year with his assistant, Dr. U. Maes, who, by a large and constant practice on the cadaver, has acquired unusual expertness in this rather difficult procedure.

He concluded that in the hands of an expert, careful and experienced surgeon, the anesthesia of the trunks of the trigeminus at the basal foramina, more particularly the second and third divisions, and the Gasserian ganglion

itself, was a perfectly feasible and practical procedure which could render decided service in the surgery of the face. It would also permit of a satisfactory, safe, and certain relief of trigeminal neuralgia, especially when the exact localization of the nerve or the ganglion was determined by obtaining a complete and demonstrable anesthesia with novocain-adrenalin, before the alcohol injection was made. The injection of the ganglion through the foramen ovale by the Härtel route was not free from fallacies and dangers, but taken as a whole, it constituted a decided advance in the regional anesthesia of the face. He did not advocate the alcoholization of the Gasserian ganglion for the treatment of neuralgia, as the neurolytic effect on the ganglion was as complete as by the operation of gasserectomy, and secondary neurotrophic keratitis and other destructive lesions of the eye were as likely to follow a thorough alcoholic injection as after the extirpation of the ganglion. For purely surgical purposes the complete anesthesia of the ganglion could be obtained with adrenalin-novocain solution (1 per cent. novocain in adrenalin 1 to 1000) which controlled the entire area supplied by the ganglion and its branches, thus permitting painless and yet very extensive and prolonged operations. The anesthesia of the trigeminal distribution in this way has not been followed by any injurious neurotrophic effects on the eye.

LARGE RETROPERITONEAL CYST ATTACHED TO THE APPENDIX VERMIFORMIS

Dr. Matas also reported and exhibited with lantern slides a specimen of a rare, retroperitoneal, multilocular, retrocecal cyst of the appendix vermiformis of large size, weighing 1582 grams (over 52.7 ounces) which contained a gelatinous, coagulable, myxoid fluid of variable color and consistency. It measured 47.5 cm. in circumference ($18\frac{3}{4}$ inches) around

its longest diameter; 17½ cm. in breadth (7 inches), 10 cm. in thickness (4 inches), with a perimeter of 56 cm. (22 inches). It was in no sense a retention cyst or hydrops, as the appendix was quite distinct and separate, though intimately attached to the mass. Its origin was doubtful and obscure. It was evidently a connective-tissue sac with multiple compartments lined with endothelium. Probably an outgrowth of some embryologic relic connected with the mesentery; possibly a development of an original lymphangioma cavernosum of the mesentery. The mass had been removed from a young man, aged twenty-five years, who had recovered uneventfully after the intervention.

DISCUSSION

Dr. C. E. Caldwell, of Cincinnati, Ohio.—In regard to the contribution relating to retrocecal tumor, I would only make the one suggestion to Dr. Matas that he may possibly find an explanation for these tumors in a recent contribution on the "Embryology of the Lymph System," by Florence Sabin, who has done considerable work on the route of the lymph vessels. She has shown that these vessels and lymph spaces originate from the vascular system and along fetal veins that run up to the median fetal veins, and from these extravascular lymph spaces we have, through arrested development, the origin of multilocular cystic tumors, as I shall endeavor to show in my paper on congenital tumors of the neck.

Dr. V. P. Blair, of St. Louis, Missouri.—I always look with a geat deal of interest on anything that Dr. Matas puts forth because we always gain some information from what he says. I have the temerity to speak on this subject because after making some studies (a little over 150 injections) in 92 cases mostly for therapeutic purposes, together with my work in the dead-house and on skulls, there are some things that have occurred to me. We have definite rules for finding the foramina, but we have used the external pterygoid plate to find the depth. Going through the sigmoid notch until the pterygoid plate is located, the foramen ovale will be found just behind and the sphenomaxillary fissure just in front of

its upper end of the pterygoid process. You can pass a needle one-half centimeter deeper than the depth at which the external plate was encountered, with perfect safety either into the sphenomaxillary fossa or toward the foramen ovale. If you go one centimeter deeper into the foramen ovale you either go into the ganglion or if slightly lower than that you get into the Eustachian tube. If you go one centimeter deeper than that into the sphenomaxillary fossa you are apt to get into the nose which is fraught with no bad consequences. That is one point.

Another thing is that our failures sometimes are more interesting than our successes. I once purposely injected the ganglion. I have done it only a few times. The woman was in a very low physical condition from having been kept a long time under the influence of scopolamin. She was intensely suicidal. I was so anxious to get a result that I deliberately entered the ganglion but did not go deeply. I injected four cubic centimeters of a mixture containing alcohol. The woman got perfect anesthesia over the whole distribution of the branches of the ganglion. There was paralysis of the seventh and eighth nerves. The ultimate outcome was that the seventh cleared up, and the eighth not entirely, but very poorly.

Without taking up much of your time with the many explanations that had to be considered, after careful consideration, the only conclusion I could come to was that the injected fluid followed the great superficial petrosal nerve into the aqueduct, caught both the seventh and eighth nerves at that point. It is hardly reasonable that it could have traveled the base of the skull into the posterior fossa and caught the seventh and eighth without catching the sixth which was not involved. I am afraid to put alcohol in the ganglion.

THE REMOVAL OF THE COLON FOR OBSTRUCTIVE FECAL STASIS, WITH A REPORT OF EIGHT CASES

By John G. Clark, M.D.
Philadelphia, Pa.

The various ptoses of the viscera are now in the surgical proving-ground, and all will admit that the devising of effective ways and means of remedying these abnormalities is attended by more difficulty than is usually encountered in other fields of medicine. This difficulty is due to the fact that the condition is neither a disease nor a disability of a single organ, but a manifestation of a general abnormal physical state, of congenital or acquired origin, accompanied by more or less profound neurasthenic symptoms. The surgeon can help at most but a small percentage of individuals so afflicted, for although advances have been made in the operative treatment, no single measure has as yet proved so efficacious as to gain general approval.

All malpositions of the colon are primarily of congenital origin; if active from the beginning of extrauterine life; the general bodily conformation gives evidence of it, a genetic factor elucidated by my associate, Dr. F. E. Keene, in a series of autopsies performed on newborn infants. The clinical picture as it is seen in the adult has been well depicted by many writers, noteworthy contributions having been made by Smith, Franklin Martin, Goldthwaite, Reynolds, and others in this country. The essentially congenital cases, with pronounced bodily habitus, can seldom obtain relief

from surgical treatment if adult age has been reached, since, as the result of years of malnutrition and fecal intoxication, the entire body has become stunted and more or less defective. It can scarcely be expected that the lifting up or even the excision or anastomosis of offending organs can effect so complete a metabolic revolution in a patient of adult age as to result in even a moderate state of well-being after years of distorted growth. That such cures can be effected is contrary to all laws, and has never been confirmed by comparative studies in the treatment of analogous defects in growth either in the lower animal or in other allied natural kingdoms. Briefly stated, therefore, I believe that persons the subjects of defects, which have actively retarded their growth, physically, nervously, and even mentally, until adult age has been reached, cannot be either cured or radically relieved by any surgical measure, and that the less often such measures are invoked in this class of cases the more likely are we to succeed in a second type, in which benefit may possibly be accomplished.

No organ is subject to more variations in its embryologic growth and rotation than is the colon. Starting as a straight tube it must twist from left to right, forming first the descending, then the transverse and finally the ascending colon. Not only is this rotation a complicated mechanical process, but the formation of the mesentery of the transverse colon and the fixation of the ascending and the descending portions are subject to wide variations within normal physiologic limits.

There is, therefore, no colonic pattern of fixed anatomic standard according to which physiologic or pathologic variations may be judged. No tape-measure or topographic marking can define what is normal and what abnormal, and the *x*-ray alone is without value in determining any line of treatment, except insofar as the fluroscopic study or serial negatives indicate failure in motility, or define a localized point of stasis, when there is obstructive functional derange-

ment. Therefore, definite and characteristic symptoms alone should guide us in the treatment of the obstruction. The *x*-ray examination like other laboratory tests may assist in the making of the diagnosis but it cannot be the weighty factor in dictating an operation.

It becomes increasingly evident that the cases that may be benefited by surgical interference are those that have evidenced varying degrees of constipation from birth, but without serious default in general development, and who later, as the result of accidents, the stress of child-bearing or an ever-increasing constipation, finally reach a stage of partial obstruction.

Encouraging possibilities in the operative treatment of properly selected cases are evident from the published reports of men who have approached these cases from different standpoints. These various reports have contained sufficient evidence to at least warrant one in trying some of these operative measures in the most obstinate cases of fecal stasis. Lane, who has proposed the most radical of all, has asserted that the true basis of the condition is the noxious influence of stagnating fecal matter, which promotes bacterial activity and increases the absorption of the toxic products generated in the colon of the constipated individual. In a large series of cases, he has excised the colon, and in many others he has performed ileosigmoidostomy, believing that thus he has removed the very source of the trouble.

Everyone who suggests a new operation or who propounds a novel theory is likely to be carried far afield in his enthusiasm. Even should we grant that this may be the case, the evidence nevertheless indicates that there may be a considerable element of worth in Lane's suggestion. In the light of our series of eight cases, however, we can by no means share the optimistic theories of Lane and his followers. For years, we have maintained that when the physician abandons one of these cases as hopeless the surgeon may legitimately step in and offer possible relief in an occasional

case, provided obstructive symptoms are evident. As we view these cases, the same rule applies to intestinal stasis as to cases of movable or floating kidney—*no obstructive symptoms, no operation.*

I have performed the hammock suspension operation in a considerable series of cases with satisfactory results in almost 50 per cent.; in others partial relief was secured, and in a definite percentage no relief, or even an exaggeration of previous symptoms followed; in one instance death ensued from acute dilatation of the stomach. From this it will be seen that the operation is by no means a cure-all, but that the most satisfactory results are obtained in those cases in which the transverse colon is weighted with fecal matter, but is not so redundant or so dilated as to interfere with its proper return to the upper abdomen. If the colon is greatly redundant or markedly dilated, this operation is not effective, and, in my opinion, should not be performed.

In two cases, in which I attempted to deflect the fecal current by making a lateral anastomosis between the cecum and the dependent transverse colon, or between the latter and the sigmoid, the effort was not successful, the symptoms being in no way alleviated. Here, as in a gastro-enterostomy, an artificial opening made between two hollow viscera will not remain patulous or effectively deflect the intestinal current if the regular channel is not closed.

In a few instances, effecting a lateral anastomosis between the loops of a redundant sigmoid gave relief, but even here the outcome is somewhat doubtful. My experience bears out what I have so frequently reiterated, that only a very few of these patients should be submitted to surgical treatment; on the other hand, however, I am free from surgical pessimism, for the evidence that some of these cases may be improved greatly and others completely relieved is too convincing. The major operation, *i. e.*, excision of the colon, as suggested by Mr. Lane, will be alluded to in the histories of eight cases, which I shall recount, with full reports of

previous symptoms, convalescence, and results achieved up to date.

Theoretically, when Lane first proposed it this operation did not appeal to me, and now, in the light of my experience, I cannot share his optimism. In fact, a careful study of the after-results in my cases convinces me that there is serious doubt as to the ultimate efficiency of this very radical procedure unless its field is very carefully restricted. The operation is one of first magnitude, and should not be performed except in the most exaggerated cases. To apply it for the relief of conditions such as ordinary constipation and other more remote pathologic conditions which are supposed to arise from toxic emenation is not only most hazardous but may lead to great evil. The dangers of the operation do not terminate with the operative recovery of the patient, and no case can be judged by the immediate results be they ever so favorable, but should be followed for months and years before an opinion can be expressed. Even with the greatest care in the removal of the colon, considerable raw areas, represented by the retracted mesentery and incised peritoneum, remain with which the loops of small intestines come into contact. Further, the loss of the omentum, which is so valuable an aid to the abdominal surgeon in protecting the patient against vicious postoperative adhesions, greatly increases the dangers of obstruction between the loops of small intestines and the anterior abdominal wall. Another danger lies in the anastomosis of two freely movable organs, such as the ileum and the sigmoid flexure, which renders periodic or even permanent obstruction from kinks at the point of anastomosis likely. Also the loss of the ileocecal valve may prove to be a very serious disadvantage, because of the dangers of a reflux of gaseous and liquid matter deposited in the colon.

Although the colon may not be a vital organ, it certainly is an important one, and should be dispensed with only when its presence becomes a permanent menace to life. Our

preconceived idea from our physiologic studies have pointed out certain theoretic dangers from functional derangement after the removal of the colon, which have, however, in actual practice, proved incorrect. Two widely accepted physiologic statements are fallacious: (1) the colon, although capable of absorbing large quantities of water is not the only source of aqueous intake, for these patients do not suffer unduly from thirst during surgical convalescence or subsequently; (2) diarrhea is not a concomitant of the immediate postoperative days.

So far as untoward physiologic deviations are concerned, judged from my brief experience, the systemic changes incident to removal of the colon do not appear to be profound, and the chief hazards, therefore, emanate not so much from a vital functional derangement due to the loss of the organ as from operative mishaps. On the other hand I have not witnessed the remarkable transformation in metabolism, temperament, and nervous system so ardently claimed by Lane and others. Although I have performed eight colectomies without an immediate fatality, I nevertheless regard the operation as a grave one, not to be undertaken lightly. At best we must admit we are still in an experimental phase of this work, which may end to the final discredit of this radical operation. Further, and bearing directly upon this point, these patients must be kept under the strictest surveillance and their course must be followed for a prolonged period, for upon the remote and not the immediate postoperative results the future of this procedure depends. An overoptimism has been a frequent source of error in other novel procedures, and as a result the surgical world has had to retreat from ill-advised or even disastrous positions that have been too hastily accepted. It is not surprising, therefore, that many physicians and surgeons who regard this as an invasion of what they assume to be the domain of neurasthenia feel that the removal of the colon is not only a hazardous operation, but one that is not justi-

fied by the probable outcome, so far as beneficial results are concerned. Personally, I am most skeptical as to the final outcome in cases in which the colon is not at least partially obstructed, for I cannot accept the theory that the colon is a useless organ. From my limited experience I would assert that if the most conservative methods are adhered to, benefit may accrue from surgical intervention in these cases, but even with these successes there will be a large percentage of failures. A summary of my eight cases of colectomy shows the following results:

1. The radical relief of constipation in five of the eight cases.

2. An absence of thirst in all but one case, and in this only of moderate degree.

3. An absence of immediate post-operative diarrhea in all cases, this symptom appearing several months later in one patient.

4. A somewhat remarkable gain in weight in five cases.

5. Striking improvement in general health in three cases with a considerable disappearance of neurasthenic symptoms; only partial or doubtful improvement in two and complete failure in two; death of another from postoperative adhesions some months later.

Although, as will be seen from a review of our cases, the immediate results were all favorable, yet the subsequent history, as has already been noted, may prove disappointing; therefore, it behooves everyone who performs even a small number of these operations to keep the closest possible oversight of these patients after they leave the hospital. The most critical judgment should be brought to bear in analyzing results, for if it leads into wrong channels, this question has the greatest potentialities for surgical evil, and no one should report a single case without the fullest history and complete notes on the result some months subsequent to the operation.

Based upon practical deductions secured from the study

of cases of general ptosis, we do not consider that they come within the operative domain unless obstructive symptoms are evident. For this reason, we do not deal with the ptosis *per se*, but with the particular portion of the intestine that is so hampered by actual sharp angulation that the fecal current is dammed back or retarded; hence the symptoms of localized obstruction, rather than that of constipation, which cannot be relieved therapeutically, becomes the indication for surgical intervention.

That our attitude is a conservative one is attested by the fact that in two years we have seen only eight cases to which we considered these radical measures applicable. These cases were represented clinically by extreme degrees of obstructive constipation, and anatomically by excessive redundancy of the transverse colon or such exaggerated ptoses that one or both flexures were absent, the cecum and transverse colon were dilated, and a considerable portion of the large bowel was situated in the pelvis.

The cases in which this operation has been performed are reported here in full, so that all the data from which our conclusions were drawn as to the selection of this operation, may be considered.

The following history illustrates in a singularly apt way the fact that coloptosis in its advanced form, while it does not totally incapacitate the sufferer, so handicaps her as to render her more or less wretched:

Case I.—Gynecologic No. 3066. The patient was first seen October 5, 1909, when she gave the following history: As far back as she can remember she has had intense constipation that required large doses of purgatives to give relief. She has never had any acute illness, but at best has been only fairly well. For the last twenty years she has been subject to attacks of what she describes as "stomach trouble." During this time, there has been distention and pain after eating. At times she has had severe vomiting spells, which would be followed by comparatively long

intervals of freedom from these attacks. She has had several miscarriages, and has been operated upon since for a laceration of the perineum. Recently the patient has complained of pain on both sides, which is especially severe when she rides in a carriage. The patient is nervous and inclined to be very much depressed. She presents an emaciated appearance, and the abdomen fluctuates between flatness and tympanitic distention.

Pelvic Examination. Slight relaxation of the pelvic floor; uterus in good position; marked tenderness in the right side. Right kidney very slightly palpable, motility, however, is normal; heart and lungs, normal; spleen not palpable; no tenderness or palpable lesion in the upper abdomen.

A median laparotomy was made, extending from a point midway between the umbilicus and the pubes upward to within three inches of the ensiform cartilage. A systemic examination of the pelvic viscera was made, with the following results: Pelvic organs, normal; sigmoid flexure, very redundant, measuring at least twelve inches above normal; marked ptosis of the transverse colon, the dependent part of the loop occupying the pelvis; dilatation of the stomach; no demonstrable growth in the pylorus or duodenum; considerable dilatation of the entire colon.

As this was a case of general ptosis, an attempt could only be made to improve the symptoms, because of the excessive redundancy of the cecum, and in order to perform the least hazardous operation for her relief, a lateral anastomosis was made from one limb of the redundant loop to the other, in the hope that this would overcome the constipation.

The patient made a satisfactory operative recovery, and while in the hospital and under constant attention the bowels were kept regular and there were no gastric attacks. After returning to her home, the patient did not improve appreciably.

She was again admitted to the hospital February 2, 1912, when she gave the following history: Since the operation,

two years ago, she had periods of a month during which she was moderately well, but most of the time she was extremely constipated. This constipation was associated with severe vomiting. Since coming into the hospital, under observation, the vomiting has been slight. The patient, however, attributes this to the fact that large doses of oil have been given her, which have kept the intestinal tract clear. The vomitus contains portions of the previous meal, but at other times consists only of clear, watery fluid, The worst attacks come on at night, when the pain may be so severe as to require a hypodermic of morphin. At times she is awakened out of a sound sleep by an attack of sharp pain. She vomits food taken two days previously. There is considerable general abdominal pain, which radiates to the upper abdomen when she starts to vomit; there are constant back and hip pains. She cannot work and even the slightest exertion is followed by exhaustion; no vesical symptoms are present. There is a history also of gastric tetany. Recently, her physician has given her gastirc lavage, with some relief.

As will be seen, no relief was obtained by the first operation. As the gastric symptoms have become so exaggerated as to suggest the presence of a new growth or ulcer, a second operation was decided upon. The possibility of the removal of the colon was discussed, and the patient gave the readiest consent to any measure being taken that might afford her relief, regardless of any danger that might have to be incurred.

A second median incision was made. No adhesions were encountered. There had been a perfect anastomosis between the limbs of the sigmoid flexure, and there was no evidence of any defect in the operation that might in any way explain the progressive symptoms. The colon, as previously demonstrated, was situated low in the pelvis, and the hepatic flexure had disappeared entirely. It laid in a more or less crumpled condition, passing obliquely upward to the splenic flexure, where there was a sharp kink. The stomach was more markedly dilated than at the previous operation, and

on examination of the pylorus a large indurated mass, apparently of inflammatory origin, was encountered. This had formed, or at least had become evident, since the previous operation, for at that time there was no palpable lesion of the duodenum or pylorus. As the mass was fixed, it was deemed wise to make a simple gastro-enterostomy, in the hope that the tumor was an indurated ulcer rather than a malignant growth. After this, the ileum was detached from the cecum, and attached to the sigmoid flexure by a lateral anastomosis. The colon, from the cecum to the splenic flexure, was quickly removed, this being comparatively easy, as the entire organ could easily be pulled out upon the surface of the abdomen.

Her convalescence was rapid and uneventful, and from the day of her operation she had one or two stools daily without the use of a drug. Her appetite improved at once, pain disappeared, and the results of the operation were most satisfactory.

The patient continued to improve steadily, when suddenly, four months later, she was seized with obstructive symptoms, for which an operation was performed in another hospital. An adhesive band, that caused the obstruction was released, but the patient failed to recover. The following letter from her physician gives in detail the series of events leading up to her death:

September 1, 1912. "Our patient continued to improve from the time she left the hospital; her appetite was good, and she could eat without any feeling of distress; only once or twice did she have any pain, and then only for a short time. She gained in weight right along, having gained in all sixteen pounds. Her complexion was much better, and she was not so nervous. She told me, just two days before her death, that she felt better than she had for several years; she and her family were all greatly pleased about her condition. Her bowels moved two or three times a day, and she had vomited not more than four times since her operation

—in all, everything looked well. On June 26 she walked about one and a half miles to a neighbor's house, staying longer than she had intended. She started home in a hurry and ran part of the way. Shortly after reaching home she was stricken with severe pain in the abdomen, which kept getting worse. I was sent for, but was not at home at the time, and another physician was called in. He gave morphin and she was soon easier. In about an hour I arrived. The patient was then feeling as well as ever, and wanted to get out of bed, but I advised her not to. I left about 5 o'clock in the afternoon, feeling that all would be well, and thinking that probably she had eaten something that had caused the pain; but about 11 o'clock that night I was called out of bed to come as quickly as I could, as she was in agonizing pain. I gave her morphin, washed her stomach out, and gave her an enema, as her bowels had not passed since morning. Very little came from the bowels—nothing but water—but after an enema I noticed an improvement in the pulse. She was troubled with hiccoughing, belching, and vomiting. I began to feel than that an obstruction of the bowel must be causing all this. It was then decided to call Dr. John Atlee, of Lancaster. He was of the opinion that it was an acute obstruction, and that immediate operation was necessary. She was taken as soon as possible to the Lancaster General Hospital, and operated upon by Dr. John Atlee. It was found that a band of adhesions between two portions of the bowels had looped around another portion and strangulated it. During the operation salt solution was given by transfusion. The pulse improved, and she was in a better condition after the operation. That night and the next day she had several bowel movements. In the evening of June 28 she grew worse, and on June 29 in the morning, another operation was done. It was found then that gangrene had set in, and she died that afternoon."

This case illustrates a danger that may arise in any abdominal surgical case. So far as the immediate results of the

colectomy were concerned they were ideal, and promised the most satisfactory outcome.

Case II.—Gynecologic No. 3404. Married fifteen years. Five children. No micarriages. First labor very difficult —breech presentation; excessive hemorrhages after birth of child. Last labor premature—at the seventh month. Menstruation began at twelve years, and has always been irregular, often occurring every two weeks. Family history negative. Patient has always been delicate, but has never had an acute illness. Dates her trouble from the birth of her first child. On getting up she felt generally miserable, and had constant dragging pain on both sides of the abdomen, low down. Before her second baby was born she had congestion of the kidneys; legs and feet were considerably swollen, but pregnancy was not interrupted. After the third child there was excessive vaginal discharge, with shooting pains through the groins and more or less constant backache on both sides of the sacral region. She complained of fulness and headaches in the occipital region, and became nervous and depressed. Exacerbation of symptoms during menstrual periods. Vesical irritability has for some time been so exaggerated as to compel her to rise three or four times during the night to void urine. Has always been subject to constipation, but since her first baby was born this symptom has assumed an obstructive character. She has pains in both kidney regions, becomes nauseated, and has cold, clammy sweats, with paroxysmal pain in the lower abdomen. Beginning with simple laxatives she has now taken Epsom salts every day. As long as twelve days have elapsed without a movement. Bowels did not move for five days before she entered the hospital, although she had taken large doses of purgatives.

Patient has been under observation by my associate, Dr. Keene, in the University Dispensary, and he referred her to the hospital because of obstructive symptoms. *X*-ray reveals the most exaggerated coloptosis.

An exploratory incision was made, with a view to relieving the acute symptoms and doing such necessary operative work as the abdominal conditions demanded. A long median incision was made. The position of the colon bore out the *x*-ray findings—the flexures, particularly the hepatic, had disappeared, and the largest part of the colon was situated in the pelvis. It could easily be drawn out through the incision, rendering its resection comparatively easy. The ileum was detached, and a lateral anastomosis between it and the sigmoid flexure was made. The ascending and transverse portions of the colon were removed.

The patient stood the operation well, but marked symptoms of shock appeared immediately after. Following the operation the patient had daily bowel movements—frequently as many as three or four a day.

Subsequent Postoperative Notes. September 3, 1910. Patient doing well; temperature 99.1° F.; pulse, 88; respiration, 28.

September 4. Considerable vomiting; slight distention. Enteroclysis. Temperature 99° F.; pulse, 130; respiration, 25. Face flushed and anxious. Weal peristalsis.

September 5. Improved; vomits only occasionally temperature, 101° F.; pulse, 120; respiration, 28. Enteroclysis administered without difficulty. Distention has disappeared. Peristalsis is evident.

September 6. Patient improving. No vomiting. Watery bowel movement. Temperature, 99° F.; pulse, 106.

September 7. Patient comfortable, drinking albumin-water. Incontinence of feces.

September 8. Patient comfortable. Frequent evacuation of bowels. Incontinence of feces.

Following the last note, and until the time of the patient's discharge from the hospital, the incontinence improved steadily and within ten days after the operation, she had complete control over the bowels. She made a steady and satisfactory recovery.

November 6. Since leaving the hospital the patient has improved progressively. Bowels moved once or twice daily without the use of cathartics, making the most radical change in the patient's life, for she states that she has not had a natural bowel movement for years without the use of the most drastic purgatives. She has gained slightly in weight. Her appetite is still below normal, and when she takes considerable solid food, she has sharp pain beneath the ensiform cartilage. but there is no reference to pain at the point of anastomosis. She drinks large quantities of water, but is not abnormally thirsty. There is now no tympanites.

May 12, 1912. Patient has made satisfactory progress since the last note was made. Bowels now move once daily and the stools are formed. She has some thirst, but at most, she does not take more than eight glasses of water a day. At times she has slight attacks of pain in the epigastrium and some nausea. She now weighs one hundred and ten pounds—the most she has ever weighed. She attends to her household duties and has the care of a semi-invalid daughter. The only distress she complains of now is the bearing-down sensation, which comes from the relaxed pelvic floor.

Examination shows a vaginal outlet markedly relaxed and the uterus in slight descensus. Moderate fulness in the left side, but no pain or tenderness over the point of anastomosis.

October 10, 1913. Patient reported for examination at the University Hospital. She says she is now quite well.

From an analysis of this case I would say that the following improvements were effected: (1) Absolute relief of constipation; (2) marked improvement in nutrition; (3) decided increase in efficiency, the patient having formerly led a semi-invalid existence, and now being able to do her own work.

There are no symptoms referable to the gastro-intestinal

tract except an occasional loss of appetite and slight distress over the epigastrium, which is not of sufficient severity to interfere with the performance of her duties. Speaking most conservatively, one may say that a 75 per cent. of restoration of efficiency has been gained in this case. Without undue optimism one may, therefore, count this as a good result.

Case III.—Gynecologic No. 3689. Patient a married woman, aged forty-six years, Two children. Was operated upon in 1902 for extensive pelvic inflammatory disease, the tubes, uterus, and ovaries being removed. The patient made a satisfactory recovery from the operation. At the time of her discharge from the hospital she had pain over the upper part of the abdomen after eating. She returned one month later, still complaining of pain in the right side of the abdomen. Examination at the time, however, failed to reveal anything abnormal. The patient was again admitted to the hospital in 1906, to Dr. James Tyson's service. According to her history, she had gained thirty pounds subsequent to the operation, and says she was entirely cured. One year later, however, she began to have pain on taking food, which was followed by nausea and vomiting. After four weeks' treatment in the hospital she was apparently relieved. Two months later she had a serious fall from a considerable height. Since then she has had more or less continuous abdominal pain, headache, backache, nausea, vomiting, and general nervousness. She has been admitted to the medical wards of the University Hospital three or four times for the treatment of gastric distress and constipation. An examination of the stomach at the present time shows a marked ptosis. The colon is situated very low in the abdomen. The patient was referred to the gynecological ward after several months of ineffectual medical treatment. An incision was made midway between the symphysis and the umbilicus. The transverse colon was found to be adherent to the lower angle of the wound; the stomach was likewise

anchored through this attachment of the transverse colon. The adhesions were freed. The patient was placed in the Trendelenburg posture, and the hammock type of operation was performed. She made a satisfactory convalescence, and a very mild laxative was administered—sufficient to move the bowels. A skiagraph made subsequent to the operation showed the stomach to be in good position above the umbilicus. Patient was feeling very much better. She was seen from time to time subsequently, and made a most satisfactory improvement.

After a heavy fall there was a recurrence of symptoms, and she was admitted to the hospital April 10, 1911, five years after the last operation. At this time the following notes were made: Patient was perfectly well alter her operation; appetite was good; food was retained and she gained steadily in weight. No gastric symptoms appeared for one and a half years. Following a severe strain there was a gradual return of her former symptoms—loss of appetite, a heavy sensation in the epigastrium, a feeling of fulness and gaseous eructation after eating, vomiting, and acute general gastric pain. Symptoms of obstruction, more or less paroxysmal in character, were present. Bowels now only move on using cathartics. Patient has lost rapidly in weight, and has fallen into a very wretched state of health. An *x*-ray examination showed the colon again in an exaggerated ptosis. It had apparently slipped away from its mooring to the anterior wall, and was situated in the pelvis. The patient was suffering from obstinate constipation, with recurring symptoms of obstruction. Removal of the colon was advised. The operation was undertaken with considerable hesitation, for the patient was of a decidedly neurotic temperament. Up to this time medical treatment had given but temporary relief.

At operation the colon was removed and an anastomosis of the ileum into the sigmoid flexure made. The duodeum was now found to be very greatly dilated, being at least

twice its normal size, its walls being very thin and attenuated. On account of the more or less constant vomiting from which the patient had suffered previous to her entrance to the hospital the last time a gastro-enterostomy was deemed advisable. Considerable shock followed the operation, and for a few days the patient was in a critical condition. After this, however, she made a rapid convalescence, and the most satisfactory immediate results were noted from the operation. She began to take food at once, her appetite became normal, and there was a rapid increase in weight. For fifteen months the patient remained in perfect health. About this time she assumed full charge of her husband during a serious illness, which, added to other causes, resulted in a nervous breakdown, and for the last three months she has suffered more or less continuously with diarrhea. She was at once referred to Dr. Fred H. Klaer, chief of the medical dispensary, who has kept several of these cases under observation subsequent to operation. November 12, 1912, Dr. Klaer writes concerning this patient:

"At the present time she is having from eight to twelve liquid bowel movements daily—they seem to be more frequent just after meals and when she is recumbent. The reason for the first might easily be that they are due to the increased intestinal peristalsis after meals, a condition we frequently find in certain forms of irritable stomach with either increased or subacidity. The reason for the greater frequency in the recumbent position I am at a loss to explain. While she has lost some weight in the last few months, this has not been excessive, and at the present time she is about at a standstill. She is active about the house, doing more or less of the light housework, and refuses to regard herself as an invalid. Let me state further that for a number of months after the operation she did very well, gained remarkedly in weight, and was doing considerable work. During this period she had an attack of looseness of the bowels, similar to the present rather protracted attack,

but not so severe, which was easily controlled by treatment directed to her gastric digestion and proper food. The onset of her present trouble, now several months back, was due to her taking care of a sick husband and doing housework besides. We have found her a hard patient to handle because of her nervous temperament and great ambition to be doing things about the house."

November 2, 1913. Diarrhea ceased eight months ago. Bowels now move three or four times daily, usually after eating. Movements are now partially formed. Has had no trace of constipation at any time. Complains of aching pains, beginning in epigastrium immediately after eating and extends over entire abdomen. Great deal of belching and occasionally has attacks of vomiting immediately after eating. No hematemesis. During the stage of diarrhea she weighed eighty-eight pounds; now weighs one hundred pounds. Appetite poor. From a review of this history I cannot class this as a successful case. Although the patient's efficiency is greater than it was previous to her last operation, and although, unquestionably, she has very markedly improved since that time, she is still a semi-invalid. Certainly the constipation has been completely relieved.

Case IV.—Gynecologic No. 3938. Colored woman, aged thirty-five years. Operated upon before the Clinical Congress, 1911. Married fourteen years; one living child; five miscarriages. Menstruated first at seventeen years. Flow has always been very scanty and irregular. Patient has never been strong, but in her younger years was able, in a measure, to carry on her domestic duties. She dates the onset of almost complete invalidism to thirteen years ago, when she had a miscarriage which was followed by more or less persistent leucorrhea. She was, however, able to go about until a second abortion occurred, which was incomplete, and required a curettage. She had four miscarriages, each occurring after the third month, but finally, eleven years ago, a seven months child was born, which is now

living. Immediately following this labor she became an invalid, suffering from severe headaches, insomia, weakness, and nervousness, spending most of her time in bed. She could do no housework. Since last March the periods have occurred every two weeks; this she attributes to the removal, in another hospital, of the left ovary in the early part of that month. At the time of her entrance to the University Hospital she was suffering from severe headache. So far as she can remember she has always suffered from constipation, which grew much worse after the birth of her child, and has become practically obstructive since her operation in March. There is no pain on defecation, but a constant dull bearing-down pain, and there is occasional shooting pain through the rectal region. There are no urinary symptoms except an urgency to empty the bladder. Although she does not vomit, she is constantly raising mucus. Occasionally she takes mustard water to relieve her. Regurgitation of food and gas follows every meal. The stomach has been washed out several times, with immediate relief. There is no hematemesis, and she has these gastric symptoms only when she is markedly constipated. She never passes any flatus, is unable to have a natural defecation, and must resort to the most drastic purgatives to effect a bowel movement. The patient is a sparely built woman, and has the appearance of being very ill. In view of the prolonged history of this case an operation was considered advisable only because of the increasing obstructive character of the constipation.

Physical Examination. Patient thin-chested, without an excess of fat; indeed, she is quite emaciated. The lungs are normal. There is a slight mitral murmur, but no evidence of lack of compensation. On inspection of the abdomen there is exaggerated bulging below the umbilicus, with a depression in the epigastric area. Marked abdominal tympany, incident to gaseous accumulation in the colon, is present. Uterus in acute retroflexion; pelvic floor, normal.

Hemoglobin, 55; otherwise the relative blood-count is normal. Urine normal except for a slight trace of albumin.

X-ray Examination. Reveals an exaggerated ptosis of the colon. The hepatic flexure had disappeared, and the bowel appears as a crumpled tube, chiefly occupying the pelvis. Because of the obstructive character of the patient's symptoms, an operation was deemed advisable, its nature to be determined after a careful inspection of the abdominal contents.

November 10, 1911: Celiotomy was performed. A median incision was made, revealing adhesions between the prolapsed colon and the ventral scar. Upon freeing these it was found that the colon, as shown by the *x*-ray plate, had practically become a pelvic organ. There was no hepatic flexure; the transverse colon was of abnormal length, passing obliquely upward from the cecum to the splenic flexure. The colon was dilated, but otherwise appeared to be normal. After freeing the adhesions it was found that the stomach was pulled down and was somewhat dilated. The entire colon possessed a mesentery, and could be delivered through the incision. A colectomy was decided upon, because the colon was found to be redundant, dilated, and markedly dislocated, and it was impossible, in a flat, retracted abdomen, to replace it to even an approximately normal position with any hope of having it resume its normal function. The excision, therefore, was begun at the splenic flexure, following the course of the transverse colon to the cecum, and including eight inches of the ileum, which last was connected with the lower portion of the sigmoid flexure by a lateral anastomosis. The operation consumed one hour. The patient left the operating table with a pulse of 90, but within three hours it had reached 140, strongly suggesting postoperative hemorrhage; this possibility was ruled out, however, by the absence of other symptoms of internal hemorrhage. The pulse remained between 120 and 130 for two days, after which it dropped to normal and the patient made a satis-

factory recovery. On the third day the bowels moved spontaneously twice, and subsequently, for a day or more, three or four times, then decreasing in number until the twelfth day, when she had only one or two movements. There was no undue thirst, her appetite improved rapidly, and before leaving the hospital, on the fourteenth day after the operation, she took the ordinary ward diet without any discomfort. All her neurasthenic symptoms disappeared rapidly.

Since her dismissal from the hospital the following notes were made regarding her progress:

February 11, 1912. Three months subsequent to operation patient returned to hospital, declaring that she felt perfectly well. There is no irritability of the bladder, and bowels move daily. She eats all food without distress, sleeps well, and does her entire housework. The pain in her back and distress in the abdomen have disappeared entirely, and she is steadily gaining in weight. She has taken no laxative or purgative since she left the hospital.

Since the last note was made the patient was seen once or twice, but for the last six months nothing having been heard from her, an assistant hunted her up and reports as follows:

October 20. Patient is doing her housework, and is apparently in the best of health. Says that she is in better health than she has been in for years. From her former weight of one hundred and fifteen pounds she has gained until now she weighs one hundred and thirty-six pounds. Sleeps soundly and has a good appetite. Subjectively she states that she has slight periodic pain in the right chest, possibly due to her old mitral lesion, but there is no dyspnea or swelling of the feet. Abdomen negative, no distention or painful areas. Heart beats normal. Heart sounds are good, but there is a slight systolic murmur. Menstruation, which formerly was irregular and of two days' flow, now occurs every twenty-eight days, and continues for three or

four days. It is not accompanied by pain, and is apparently normal, for the first time in the patient's life. She never takes a laxative, and has two well-formed movements daily without pain. Says she is now perfectly well and happy, and never was so before. Skin warm, moist, and soft, and temperature normal. As a final commentary upon this case I count this as a remarkably satisfactory cure.

Case V.—Gynecologic No. 4192. Patient aged thirty-eight years. Married seven years; one child; labor difficult. Menses have most always been irregular, at times over and frequently under the normal period; duration about two days; no pain. Weight at present one hundred and nine pounds. Her best weight was one hundred and twenty pounds. Never had any serious illness. As far back as she remembers she has been constipated, requiring cathartics frequently. About fifteen years ago she began to have severe occipital headaches, which forced her to give up her regular work during the attack. At these times she noticed that the constipation was more stubborn and that these headaches bore a distinct relationship to the condition of the bowels; that as constipation produced the headache, an evacuation relieved her. She has had indigestion for years expressed by a fulness in the epigastrium and belching. During the past year solid food has caused pain in the epigastrium, radiating along the costal borders, and more marked on the left side; also downward toward the left iliac region. This pain comes on immediately after meals, and is often severe enough to double her up; it is usually relieved by hot and cold applications. Liquids do not produce the pain. She has had attacks of vomiting, food remnants being present in the vomitus of the day before. There is no hematemesis. She suffers greatly with sour stomach and belching. Cathartics no matter how drastic, have little or no effect beyond producing pain in the left iliac region. Only a large enema gives relief. As long as fourteen days have elapsed without a bowel movement. She is never troubled with diarrhea.

Her movements are usually hard, and no excess of mucus and no blood have been observed. She has a constant feeling of depression, and has lost eleven pounds in weight during the last month. Although her appetite is not impaired she refrains from taking solid food because of the pain it produces. Aside from a frequent desire to urinate when standing, no symptoms referable to the kidney or bladder are present.

Physical Examination. Thin, spare-looking woman; no excess of fat, but on the contrary presents an emaciated appearance. Flat-chested; heart normal; lungs normal; abdomen distended with gas, chiefly manifest below the umbilicus, and generally tympanitic. Slight palpable mobility of the kidney on the right side; left side negative. No points of tenderness or pain on pressure over the gastric area. Sent to the *x*-ray laboratory for examination.

May 7, 1912. On account of the exaggerated degree of coloptosis and increasing degree of obstruction, loss of weight, and marked invalidism of this patient, operation was decided upon. A median incision was made. The colon was found to be practically a pelvic organ. There was a sharp kink at the splenic flexure, with marked dilatation of the proximal colon. Pelvic organs were normal. Gall-bladder and stomach were normal, so far as demonstrable lesion was concerned. The colon was of enormous size, being not only greatly increased in length, but in diameter as well. The walls of the colon were markedly attenuated. No flexure present in the hepatic area. The colon was excised, beginning with the ileum, about four inches from the ileo-cecal junction, and extending around to the upper portion of the sigmoid flexure, lateral anastomosis between the ileum and sigmoid was effected. The sigmoid flexure itself was redundant, and to prevent sagging and possible obstruction of the anastomotic junction, the upper portion of the sigmoid at the point of excision was suspended from the parietal peritoneum, and covered with a cuff of omentum. A rectal

tube was inserted beyond the site of anatomosis into the small intestine.

May 8. Patient left the operating table with a pulse of 120, but during the first few hours it increased to 130. By the following day it had dropped to normal. Patient's general condition good. Vomiting persisted, but it was not expulsive in character and was small in quantity. Fecal matter passed through the rectal tube. There is no distention, and peristalsis is present, although weak. Patient does not complain of thirst—in fact she does not care for water. Bowels move through the tube, which still in place. Her only complaint is of occasional nausea.

May 30. Patient complains of abdominal pain, more or less general, but most acute in lower abdomen. Some abdominal distention. Irregularity of temperature, due to a left femoral phlebitis. Bowels slightly constipated.

June 5. Much improved; temperature normal; and pain has disappeared. The abdominal pain is accounted for by a slight damming back at the point of anastomosis, for the bowels are now moving regularly and she is again comfortable.

June 11. Patient discharged, feeling well. Bowels move easily and are well formed; occasionally a simple enema or glycerin suppository is necessary. During her convalescence sharp cramp-like pains gave rise to a fear of possible obstruction. On September 10, 1912, the patient reports from the country, where she has gone for the summer, as follows: Until the middle of August she gained steadily, eating well, the food digesting without difficulty. There is no strain on defecation. She has taken no medicine recently. Has occasional pain, but it is not severe—usually only an uncomfortable feeling. Is slightly nauseated at times, but never vomits. While gaining speedily in strength there has been no increase in weight. Still has headaches, but not so severe as formerly. Occasional attacks of irritable bladder occur.

December 10. Since the last report the patient has made no progress, and her symptoms are not sufficiently improved to permit this case to be regarded as a satisfactory result.

February 1, 1913. No further improvement has taken place, and patient will return to the hospital for closer study. Eating causes serious distress. She has intense tympanites. There are decided signs of obstruction, due to intestinal adhesions.

April 30. Since the last note was made, the patient has become progressively worse. For a time she had considerable diarrhea, now the stools collect apparently in the lower abdomen and she becomes greatly distended and has paroxysmal pains, which are relieved only by the evacuation of a large stool. Defecation is accompanied with great pain and the patient has fallen back into her old nervous state. She has no appetite and has confined herself to a buttermilk diet for the past two months. Other than nausea, she has no other gastric symptoms, only rarely vomits and then only the normal stomach contents. Pain is on the left side over the site of anastomosis.

May 2. Second operation. Abdomen opened along the line of the old incision. The anastomotic opening between the ileum and the sigmoid was found to be patulous, easily admitting two fingers. A very interesting condition, however, developed in the blind end of the ileum under the point of anastomosis. It had become greatly dilated, forming a pouch which contained at least six ounces of fluid. It had swung upward upon itself and had become attached to the ileum just above the point of anastomosis and the pathologic anastomosis had formed between this pouch and the ileum. The operation consisted in the release of the adhesions between the pouch and the ileum and the closure of the fistula in the ileum. The pouch was then resected close up to the point of anastomosis and completely obliterated this diverticular formation. There was no evidence of adhesions in any part of the abdominal cavity.

May 18. After the operation, the patient made a very satisfactory convalescence. The bowels are moving spontaneously and she is free from any abdominal symptoms.

October 1. Since the operation, the patient has done moderately well. She is extremely neurotic. Complains of pain more or less over the entire body but on the whole there has apparently been a very decided improvement over the condition preceding the last operation. Her bowels move once or twice daily without medicine. She has no nausea or vomiting. Her appetite is good and at most she occasionally has a tympanites. Quoting from a letter from the patient, she complains "of a creeping sensation over the entire body. Has general soreness, especially about her shoulders, arms and head and sometimes her arms get weak, so weak she can scarcely lift a glass of water." In other words, the symptoms are largely those of a neurotic individual with general asthenia. Her comment concerning her gastro-intestinal state is as follows: "My bowels act real well. My appetite is good but I still have considerable gas."

As a general summary of this case, one may say that the gastro-intestinal condition has been vastly improved. The constipation has since the last operation been relieved. The pouching of the blind end of the ileum at the point of anastomosis unquestionably argues in favor of an end-to-side rather than a lateral anastomosis. As to any marked change in the woman's neurotic condition, there has apparently been very little improvement. Briefly stated, therefore, one may say that constipation has been relieved, the efficiency has been increased but the neurosis is practically as bad as ever. The pathologic examination of the resected portion of the blind end of the ileum shows it to be the seat of a chronic enteritis. The report is as follows: "The intestinal glands are irregular in size and distribution and many are more or less dilated by mucus. The stroma shows a chronic inflammatory infiltration and in one area there is a replace-

ment of membrane by fibrous connective tissue. The muscular coat contains areas of small round-cell infiltration. An enlarged lymph gland closely adjacent to the ileum is the seat of a subacute adenitis. There was no evidence of tuberculosis or new growth."

CASE VI.—Gynecologic No. 4216. Married woman, aged thirty-six years. Has been married six years. Two children; youngest two years old. Labors very difficult—instrumental. Both before and since the birth of her children her menstrual flow has been normal. At the age of twenty-one she became ill and for two years suffered from what was said to be tuberculosis. Several years later she had enterocolitis for three months. As far back as she can remember she has had obstinate constipation, requiring strong cathartics, as well as copious enemas, to produce evacuation. At times she has taken large doses of castor oil without effect. From time to time attacks of diarrhea have occurred. Frequently during the last six months she has had attacks of unusually severe constipation, followed by diarrhea and persistent vomiting for many hours, with agonizing occipital headaches. She suffers almost constantly with abdominal distention, which is often so exaggerated that the colonic outlines can easily be made out. At such times, there is severe colicky pain along the course of the colon. Gaseous eructation have been very annoying. Following the birth of her first child, all these symptoms became greatly exaggerated, and after the second one was born, the obstructive symptoms became more and more prominent. She is extremely nervous and irritable, and greatly depressed because she feels unable to give her children proper care. The occipital headaches are very severe, but are usually relieved by a thorough evacuation of the bowels. For the last year she has lost weight and strength rapidly. There are no vesical symptoms, and beyond slight heart burn and vomiting, there are no symptoms referable to the stomach. She states that when she was pregnant, the constipation was less marked.

X-ray examination revealed an exaggerated ptosis of the colon.

May 6, 1912. Operation: median incision. Colon, especially the cecum, ascending, and transverse portions greatly dilated. There was complete disappearance of the hepatic flexure, and the splenic flexure, although present, was somewhat loosely attached. The cecum was redundant, but not excessively so. Any suspension operation appeared to be useless, and the more hazardous operation was decided upon. Excision was begun at the terminal portion of the ileum, and the colon as far as the splenic flexure was excised. The ileum was attached to the sigmoid flexure by a lateral anastomosis. The stomach, gall-bladder, and rectum were normal. A rectal tube was inserted into the lieum beyond the site of anastomosis.

May 21. The patient recovered from the operation with little or no shock. Following the operation, there was moderate vomiting, with considerable gaseous eructation. Nothing has passed through the rectal tube. She has had intense abdominal pain, evidently of peristaltic origin. Her abdomen is considerably distended. She received half an ounce of castor oil this morning, followed in the evening by a glycerin enema, which produced two large movements with immediate relief of the foregoing symptoms. From this time on the patient made a satisfactory convalescence, small glycerin enemas being given daily to clear the bowel. She was discharged June 7, 1912, the bowels moving easily after a small glycerin enema. In fact, they show a tendency to be a little loose. Pain has entirely disappeared, her appetite is good, and the patient has gained rapidly in strength. Her nervous condition is very markedly improved.

November 5, 1912. Since leaving the hospital the patient has gained steadily in weight, the gain amounting to twenty-four pounds since the operation. She still suffers with headaches, but the attacks are less severe and not so frequent. At these times there is still intense nausea. Bowels move

daily without purgatives or laxatives, and she feels better in many ways than she has for years. There is no gaseous distention, although she has eructation and discomfort after taking too much food.

November 19, 1912. Since the last note the patient has dropped back into her former condition of extreme constipation. It is now quite impossible for her to effect a movement without large enemas. There is considerable paroxysmal pain at the site of the ileosigmoidostomy, indicating a partial obstruction. The headaches are as severe as ever, but the indigestion is somewhat better. As a final summary in this case, one may say that the patient is no better and that sooner or later a second operation may be necessary to overcome the increasing obstructive symptoms. This case we count as a failure.

Case VII.—Gynecologic No. 4300. Married woman, aged thirty-eight years. No children. One miscarriage five years ago. Periods were regular and painless, but were usually accompanied by headache. During the last two years she has had several convulsive attacks at the menstrual period. She is very apprehensive about these attacks and hopes the ovaries may be removed. The patient has always been obstinately constipated, and in order to produce a satisfactory evacuation has taken castor oil, followed by "Pluto Water" and enemas. The constipation became worse after puberty. In June, 1910, she was operated upon for appendicitis, and for a time there was some improvement in the constipation, but during the last year the constipation has grown worse but at no time has she had diarrhea. For years she has passed large quantities of mucus, which occasionally has been blood tinged. During this time she has had constant pain in the left hypochondrium extending transversely from above the umbilicus along the costal margin and somewhat downward. This pain is at present continuous, but sharp exacerbations, with sudden abdominal distention, occur. She often has a "feeling of a ball at the

site of the pain." This is not affected by food, but is brought on by stooping and by taking laxatives, and is relieved by a thorough evacuation. She has enormous bowel movements. Her physician says that after a thorough purgation an enema may bring away a large quantity of fecal matter. There is a sensation as of active peristaltic movements along the course of the transverse colon, stopping suddenly at the splenic flexure. When marked abdominal distention occurs, nausea and vomiting are present. Three such attacks have occurred during the last three months, no gastric symptoms whatever being present. No symptoms referable to the gall-bladder. When she was younger, she was troubled with frequency of urination, which condition lasted for a long period, but was relieved when pregnancy occurred. The vesical function is now normal. During sharp attacks of pain, rest in the recumbent posture gives relief. Severe backache, just beneath the shoulder-blade, prevents her from lying on either side.

The *x*-ray findings in this case were as follows: Dilatation of the stomach, extreme ptosis of the transverse colon, and dilatation of the cecum. Sigmoid negative.

August 12, 1912. Operation. Median incision. Topography of the colon corresponds to the *x*-ray negative. Splenic flexure well fixed; hepatic flexure only partially fixed, the bowel assumes a more or less straight course from the cecum to the splenic flexure. The cecum is very large, and quite movable, with a long mesentery. The ileum is not only greatly thickened, but its caliber is much increased. Excision of the colon to within about four inches of the splenic flexure, including the transverse colon, ascending colon, and six inches of the ileum was performed; lateral anastomosis between the ileum and the sigmoid flexure was effected. The uterus was slightly enlarged; the ovaries and tubes, normal. Notwithstanding the patient's urgent request the ovaries were not removed. Considerable shock followed the operation. Under the influence of salt solution and pituitrin,

the pulse rapidly decreased from 150 to 110, reaching normal on the third day after the operation. The temperature remained normal throughout the convalescence.

August 31. Since the operation the bowels have moved three times a day without catharsis. Today the movements are fully formed for the first time. There is no undue thirst. The taking of food always precipitates movements of the bowels. General condition and appetite are good.

September 30. Patient discharged from hospital. For the last week or ten days she has complained of pain under the left costal margin. Pain lasts only a few seconds, some tenderness remaining. No elevation of temperature. Bowels move regularly three times a day and are partially formed. One dram of castor oil is sufficient to produce free catharsis. Her general condition is excellent.

November 2. Her physician states that she has had one attack of obstinate constipation, with persistent nausea and vomiting, similar to previous attacks, but that he believes her condition is better.

February 15. Patient returned for examination. Bowels were moving easily with a small dose of paraffin. No further intestinal stasis. An *x*-ray picture shows the site of anastomosis to be patulous, and there is no damming back of the bismuth or fecal matter in the descending colon —the portion left after the operation. The patient has had another epileptic attack which has greatly depressed her and she earnestly asks that a second operation be performed for the removal of the ovaries.

September 10. Patient since the last note has had no trouble with the intestinal function. One to two movements daily. Still has pain under left costal margin. Another menstrual epileptic attack. At the urgent request of patient and husband, an ovariotomy was done. Result of colectomy was perfect, no adhesions, slight dilatation of the distal end of anastomosed ileum—invaginated for fear of further dilatation. Patient has been absolutely relieved from constipation.

Case VIII.—Gynecologic No. 4801. Patient aged twenty-eight years. Married five years. One miscarriage in the third month. No full term children. Menses occur every three weeks, lasting from one to three days. Patient is very nervous at these times but does not go to bed and does not suffer with much pain. As far back as her memory goes she has always been obstinately constipated—much worse since her marriage. Since her present illness began, she has steadily lost weight—from one hundred and fifty to one hundred and fifteen pounds. Suffers constantly with occipital headache. Sleeps very poorly, being disturbed constantly by intestinal pains and tympanites. Appetite is capricious—some days, good; others, bad. Following a meal she becomes very tympanitic—feels very full and distended. Three operations have been performed in another hospital as follows: As a result of her increasing discomfort and serious constipation as appendectomy was done three years ago but subsequent to this operation there was no relief. A second operation was performed one year ago, merely an exploratory laporatomy being done. A few calcareous glands were found in the mesentery which were removed. Again there was no relief. On account of the excessive degree of constipation a lateral anastomosis between the sigmoid and ileum was done five months ago. For six weeks subsequent to this operation she was greatly relieved, when suddenly she had the feeling as if "something had dropped within her," and since then all of her old symptoms returned worse than ever. She now has paroxysmal pain coming on, attended with obstinate vomiting. This is almost a daily occurrence. The bowel movements are liquid. She suffers excessively with tympanites. While she has always suffered more or less with indigestion, there are no symptoms directly traceable to any gastric lesion. The entire disturbance seems to be of colonic origin. The patient was seen in consultation with Dr. Kerr, of Pittsburg. On account of the excessive nausea and vomiting and par-

oxysmal pain a fourth operation was considered absolutely necessary on account of the obstructive symptoms. The patient was sent to the *x*-ray department for an examination —the bismuth passed into the sigmoid without obstruction, from there to the ileum and then passed backward through the side-tracked colon.

Operation. In consultation with Dr. Kerr. Median incision, anastomosis between ileum and sigmoid. The colon was greatly distended. There were slight adhesions, none, however, of an obstructive character. The entire difficulty therfore seemed to be an obstructive fecal stasis of the colon. The ileum was ligated and occluded close to the point of anastomosis with the sigmoid so that no pouch could possibly form. The remaining portion of the ileum to the cecum, about eight inches, was removed along with the colon around to the splenic flexure. The patient made a very satisfactory operative recovery, bowels moving daily during the time she was in the hospital. For a short time subsequent to the operation the patient continued to do well. The following note from Dr. Kerr was received October 3, 1913: "Mrs. T. returned home in good shape and continued to do well with the exception of a little soreness in her abdomen for about ten days to two weeks. She then had a severe attack of colic. A week later she had a similar attack. Pain was intense—required one-half to three-quarter grains of morphin to control it. Coincident with these attacks there was swelling in the left side of the abdomen which was quite sore and painful on pressure. I took this to be an impaction of the sigmoid and instructed the nurse to give several enemas. Considerable hard fecal matter was washed out and this gave immediate relief. I may say, however, that prior to this attack she had daily liquid movements. She has had two or three attacks since but they have not been so severe. I have instructed her to take an enema every day and wash the bowel out completely. I am not sure whether this is the cause of her trouble or

whether she may have some little obstruction due to some adhesion, but the fact that she gets relief when the bowel is cleared out leads me to believe that the whole trouble is due to impaction of the blind end of the sigmoid."

From these notes from Dr. Kerr it would appear that there is still an obstructive accumulation either in the sigmoid, as suggested by Dr. Kerr, or possibly the result of an intestinal adhesion at some other point. Unless there is very marked improvement from that just reported this case must be classed as a failure.

RESECTION OF THE RECTUM FOR CANCER WITH PRESERVATION OF THE SPHINCTER

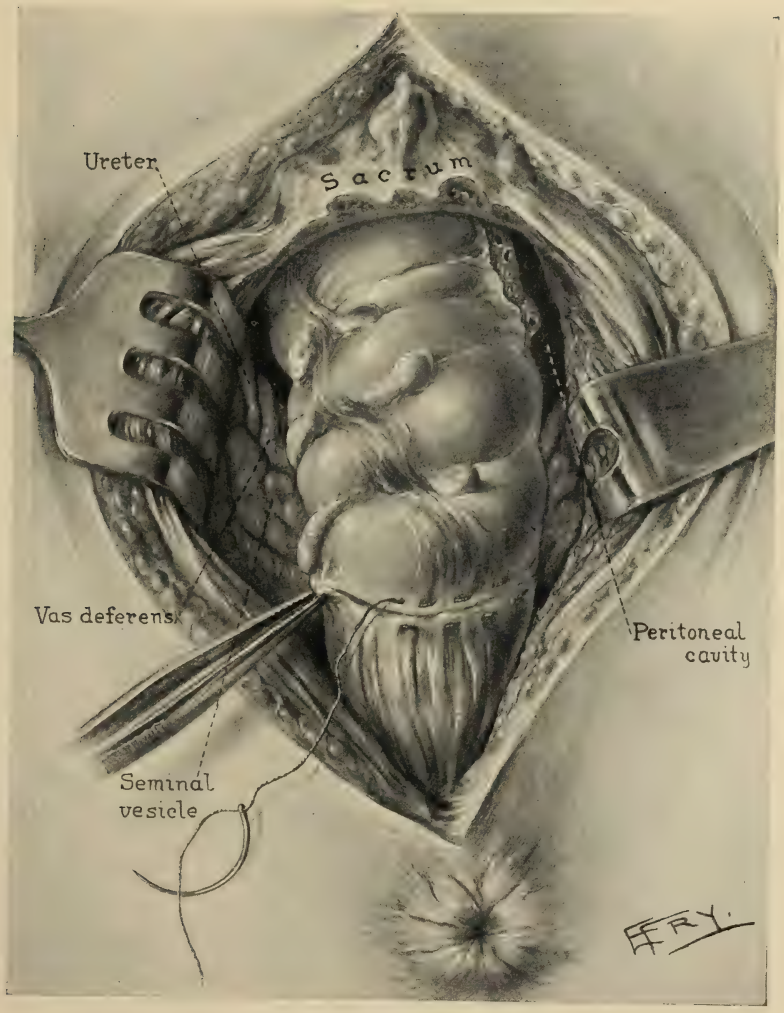
By Charles H. Mayo, M.D.
Rochester, Minnesota

The large bowel is quite commonly affected with cancer, especially the cecum, ascending colon, sigmoid, and rectum. While it is unfortunate that in the majority of cases of cancer of the large bowel the patients are late in receiving surgical treatment it is fortunate that such a malignant process may remain for a long time a local one. The lymphatics in this structure, except in the lower rectum, are few as compared to those of the small intestine and other abdominal organs. The inflammatory and cicatricial zone which surrounds such areas of ulceration acts as an effective cofferdam. In fact such inflammatory deposits often lead to early diagnosis of the true condition, and many cancers of the sigmoid and rectum considered hopeless at the time of a colostomy have within a short period become so much reduced that a radical extirpation has been possible later. Extirpation of the cecum and ascending colon for cancer has given a high percentage of cures because an anastomosis of the ileum into the colon is an ideal enterostomy for delivering semi-liquids. Maligant growths of portions of the large bowel other than the rectum are often extirpated and treated by immediate suture. As to the choice of a method of operation, each case must be considered individually. The Mikulicz method, a two-stage-resection in the movable colon is probably more commonly employed now than formerly except

in cancer of the cecum. This is one of the safest known methods, although the convalescence following is somewhat protracted.

Cancers of the rectum in which not over eight inches of bowel must be removed, the distal section not nearer than two and a half inches from the anal sphincter, are usually best removed through the Kraske sacral incision, with resection of the coccyx and part of the lower sacrum. In such operations the following procedures may be instituted: (1) A freely mobilized bowel projecting through the anus may, at times, be sutured outside; (2) a large tube may be sutured within the bowel with the terminus just within the annus; (3) a sacral anus may be made and the anal segment sacrificed; (4) a permanent colostomy may be made and the whole rectum removed at the same time or at a later period. A permanent colostomy, however, is quite abhorent to all patients and, if it is possible, they much prefer to have the intestinal delivery near its normal location even if uncontrolled, and at some additional risk from recurrence of the disease. There is no question but that the efforts to restore function or near function in cancer of the rectum and the efforts to obtain good cosmetic results in external cancer have added much to the high percentage of recurrence following operative procedures. Permanent colostomy with total extirpation of rectum undoubtedly gives a higher percentage of cures than do the methods which restore function.

In patients suffering from cancer of the rectum in the regions described we advise a colostomy and through the incision made for this purpose, the hand should be inserted and a general examination of the abdomen made including the upper abdomen as well as the pelvis. If metastasis has occurred precluding cure or if impending obstruction demands it, a permanent colostomy is made. If there are no contraindications because of metastases, a temporary colostomy is made with a sufficient spur to deflect all of the fecal flow through it.


Ureter
Sacrum
Vas deferens
Peritoneal cavity
Seminal vesicle
FRY.

The upper sigmoid should be elevated so that the lower sigmoid need not be shortened so much as to prevent the lossening of enough of it to bring together the anterior and posterior sections after the removal of the cancer-bearing area. A clear understanding should be had with these patients that, if the extent of the disease found at exploration precludes the possibility of resection with good union and yet if total extirpation of the rectum should come within the limits of advisability with cure, a permanent colostomy is to be made with the preservation of all the colon possible. For this we employ a Gursuny twist through the rectus opening of the delivery portion, or the Littlewood type of colostomy through the lateral heavy oblique muscles. Both give exceedingly good control. In either case, at the end of twelve to fourteen days a total extirpation of the rectum is made through the Kraske route.

In the separation of the carcinomatous bowel from the surrounding tissues, great care is exercised to prevent opening it and contaminating the wound. After the pelvic peritoneum is opened the upper rectum and lower sigmoid can easily be drawn down to a great extent, and when sufficiently loosened the peritoneal opening is closed by re-attaching its parietal layer to the sigmoid at a higher level with catgut sutures.

Upon completion of the division of the intestine, cutting between two pairs of forceps applied above and below the growth, the slightly exposed surface of the bowel is cauterized by the hot iron to sterilize it and effectually sear the surface against grafting thereon any loose cancer cells that may be within the intestine.

While two and a half inches of the terminal rectum is usually the limit of preservation with function of the sphincter, four inches is much more convenient in resuturing the intestine. The lower segment is usually nearly twice the diameter of the upper or sigmoidal portion. About three quarters of the circumference is surrounded by peritoneum.

This smaller upper end of the bowel is now split on the surface anterior to its mesentery, the incision extending up the bowel for one and a quarter inches, thereby adding two and a half inches to its curcumference. Upon cutting the sharp points from the divided edges the circumference becomes as great at this point as at the distal fragment. Since it is desirable to have the diameter of each end alike for a continuous suture, it may be advisable to make two shorter incisions on either side of the bowel. This extra size is demanded because the suture reduces the lumen by nearly one-half. While there is no peritoneum covering the lower segment of bowel at the point of suture, it is well known that a peritoneal surface is required only on one side for rapid healing.

To avoid fistula in the suture-line, which would usually occur at the free peritoneal or mesenteric side of the upper segment, the bowel is rotated one-half to bring the peritoneal surface posteriorly. This protects the mesenteric border. For the through and through suture, inverting the mucosa, chromic catgut is used and this is supported by sutures of fine silk which form a second row. At this stage two or three ounces of melted vaselin are poured over and into the cavity of the wound, especially the upper portion, where the parietal peritoneum has been closed. A few sutures bring the structures together loosely over the area of sutured bowel. A rubber tissue drain is inserted on either side of the intestine and brought out of the sacral incision. If the anus is not relaxed it is divulsed. If it shows any contraction upon examination it is well to divide the sphincter muscle anteriorly. This soon heals but permits thorough drainage temporarily from within the intestine. The rather large cavity which is apparent during the process of the work is quickly filled by intra-abdominal pressure as soon as the position of the patient is changed from the operative one of abdominal recumbency—legs flexed at hips over the table. Without fecal discharge there is very little danger of fistula but should one occur, it is usually so tortuous that it closes

itself. The clostomy incision can be closed, as a rule, two weeks after the resection of bowel.

For the treatment of cancer higher up, there are several methods of extirpation with or without union, all depending on the extent and conditions in the individual case. When situated lower, the spincter must of course be sacrificed.

SUMMARY. 1. The method permits thorough abdominal exploration.

2. A primary or permanent colostomy should be made in the majority of cases of this type.

3. Increasing the lumen of the anterior, and, if necessary, of the posterior portion of the bowel to double their diameter.

4. Rotation of the anterior peritoneal-covered bowel to secure the rapid healing posteriorly.

5. Stretching or division of the sphincter to secure drainage of the bowel.

6. Closure of the colostomy to secure function.

7. If colostomy is permanent, remove rectum at second operation.

REMARKS ON THE SURGERY OF THE ILEO-CECAL COIL

By Francis Reder, M.D.
St. Louis, Missouri

Without dilating upon the bacterial toxemia as a direct cause of peritonitis and death in resection of the ileocecal coil, I desire to dwell upon the operative measures that indirectly seem to harbor a causal factor responsible for so high a mortality.

The death rate of ileocecal resections for malignant or tuberculous growths coming within the scope of operative mortality have been higher than resections for similar conditions upon other portions of the intestinal tract.

In opining why so high a death rate should attend an ileocecal resection, I have formulated, as near as my experience has permitted me to judge, a ratio representing the cause of death as one-third attributable to the general condition of the patient, while the remaining two-thirds would fall upon the operative measure employed.

The most important feature for successful surgery of the intestinal tract is an early diagnosis. In how many instances has an early diagnosis been made of a tumor lesion in the ileocecal region before the growth was sufficiently advanced to be palpable? In this region it appears to me that such a diagnosis has been the most tardy of any. And why? Because the symptom picture, vague in its variations, does not presage the presence of so serious a trouble. It rather invites a diagnosis of intestinal indigestion or chronic ap-

pendicitis. The condition is often permitted to go on for weeks and months without even arousing any suspicion on the part of the attending physician. It is usually a dissatisfaction on the part of the patient that eventually causes a new light to be shed upon his condition, or, if sufficient time has elapsed, a palpable mass in the right iliac region may give evidence of the nature of the trouble. During the early stage of the disease such patients are seldom sick enough to seek their beds. In fact, they attend to some of their work. The bowel disturbances do not seem to cause much discomfort, and the appetite, although impaired, does not disappear entirely.

These patients when they reach the surgeon are suffering from a lowgrade toxemia and are often profoundly anemic. They are asthenic, and in general present an organism of a low resisting power.

To propose an operative measure for the relief of such a patient involves a problem of no mean import—that of adequately judging the physical forces of the patient. It is a serious matter to subject a patient sick with a chronic lesion of the bowel, with a wake of toxic symptoms, to an operation fraught with so much shock as a resection. If it could be judged with some certainty that the organism, impaired by disease, would recover sufficiently early from the operative measure offered to successfully cope with the virulent invasion of the colonic flora, the outlook for an operative recovery by the method known as the "ideal," would be very encouraging.

This, however, cannot be satisfactorily done, and a patient who was able to walk into the operating-room, whose anesthesia has been good, and whose condition after the ileocecal coil had been resected was apparently so encouraging that the surgeon without any hesitation completed the operation by making a lateral anastomosis, the "ideal method" may in some instances prove a great disappointment to the surgeon.

To say that the interpretation of an operative recovery of a patient subjected to the "ideal method" of resection of the ileocecal coil is speculative is open for criticism. It must be admitted, however, that the patient so operated upon has not been accorded all the factors of safety in connection with this operation.

The great danger following a successful resection of the iliocecal coil with immediate restitution of the canal lies in the secondary changes which have taken place in the intestinal walls induced by the disease for which the operation was undertaken. The complete atony of the bowel so often present, activates various infective processes generated by the pent-up bacteria. Whenever the virulent contents of the bowel become stagnant at the site of suture the suture frequently yields and a peritonitis usually incompatible with life results. One of my cases that bore the gravest aspect developed a fecal fistula on the fifth day after operation and recovered. This happy termination occurred after a patient had died by the "ideal method" on the ninth day following the operation. It rather demonstrated to me the fact that a vent became almost a necessary adjunct to this operative procedure.

The next ileocecal resection presented more than the usual difficulties. The condition seemed most favorable for the establishing of an artificial anus. This operative procedure was carried out successfully and the patient made a satisfactory recovery. An endeavor to reëstablish the continuity of the bowel two months later caused the death of this patient from peritonitis. Having had two recoveries with the "ideal" operative measure that proved in no way more severe than a simple appendectomy, I at no time underestimated the difficulties of the choice of an operation for the resection of the ileocecal coil. The death of the patient from peritonitis, the result of an operative procedure for the correction of an artificial anus, although most deplorable, rather encouraged me in this operative measure, and in the last two

Fig. 1.—Modified Paul's tube through which colon tube can be passed into large bowel for purposes of irrigation.

Fig. 2.—Resection of cecum, ascending colon, and about eight inches of ileum. End of cecum closed. Lateral ileocolostomy. Open end of ileum carried through abdominal wound, forming the vent alluded to in the paper.

cases I successfully employed a technique that carried with itself the feature of an artificial anus, but in a modified form. The advantage of this technique is a vent that will not require risky operative measures for its successful closure. The technique is as follows: Incision through the outer edge of the right rectus muscle. Ablation of the tumor and the removal of the mesenteric glands. The division of the ascending colon and the ileum is an important feature. Inasmuch as cecal growths embody considerable of the ascending colon the hepatic flexure may not be far distant. It is of some advantage to make the section of the colon at or beyond the hepatic flexure. The division of the ileum should be such as to give the bowel the necessary latitude to be brought without tension in contact with the colon, near the point of resection. At least six inches of the ileum should be sacrificed. The end of the colon is closed with suture in the accepted manner. The end of the ileum is closed temporarily with a basting stitch so as to avoid spilling any of its infective contents while the operation is in progress. A lateral anastomosis with an opening not less than three inches is performed. With a suture conveniently placed through the serosa of the bowel, the end of the resected colon is secured to the abdominal wall as far laterally as can be done to relieve tension upon the line of anastomosis, and possibly anticipate any future displacement of the gut. After the anastomosis is completed the free end of the ileum is drawn out of the abdomen, is sutured to the parietal peritoneum of the wound into its uppermost corner away from any viscus that may be liable to get caught at the point of fixation, and the abdominal wound is closed. If a more advantageous implantation of the ileal end can be made through a small secondary abdominal incision, this should be done and the primary incision closed completely.

The basting suture closing the portion of ileum brought out of the abdominal cavity is removed and a glass drainage tube introduced, thus establishing the desir-

able vent. This vent will answer the purpose not only in serving as a factor of safety in permitting the immediate escape of the contaminated bowel contents and flatus, but it will also answer the purpose in giving the necessary access for the introduction of saline solutions and irrigations so essential in a condition of bowel atony. The colon if necessary, and it frequently is necessary, can be readily irrigated by introducing a modified Paul's tube into the lumen of the ileum, down to the anastomotic opening leading into the colon. Through this Paul's tube a colon tube can be readily introduced into the large bowel and irrigation accomplished.

A disadvantage of this surgical measure is the existence of an artificial anus. Inasmuch as only the ileum is brought out of the abdomen, the artificial anus is one or much lesser magnitude and usually closes within several weeks, without the aid of a severe operative measure. Its advantage of being a factor of safety should overshadow any sense of discomfort it may cause.

ILEOCECAL RESECTIONS

Deaths:
- 3 ideal method.
- 1 artificial anus.

Recoveries:
- 2 ideal method (1 developed fecal fistula five days after operation).
- 1 artificial anus.
- 2 author's method.

DISCUSSIONS ON THE PAPERS OF DRS. CLARK, MAYO, AND REDER

DR. AUGUST SCHACHNER, of Louisville, Kentucky.—I read a paper upon this subject before this Association last year, and I wish to say that it pleased me very much to note the fairness with which Dr. Clark has treated the subject. The objection I had with the discussion on Lane's views, was that it was now a fair scientific discussion. To read Lane's views, throw the paper aside and say it is entirely too radical or heroic, is not getting at the true situation. As I stated last year, Lane's

views would either fall or stand not upon whether we think or do not think them heroic, but they fall or stand upon the truth that is behind them, and our object should be to give the subject careful study theoretically, experimentally and clinically, and attempt to arrive at the truth. I realize that it will require care in selecting the cases that are suitable for this procedure.

Opinions as to Lane's position last year were so varied that I felt it my duty to write Sir William and determine if he had changed his position. He told me that he had not changed his position; that in some cases he removed the colon, in other cases he short-circuited the colon and supplied liquid paraffin which he has found very efficient in connection with the treatment.

I agree with Dr. Clark that the radiograph does not give us any information if we rely on position. It does give us information if we rely upon the time consumed for bismuth to pass through the intestinal tract.

I did some experimental work a little more than a year ago, and that work taught me that following the removal of the colon in dogs there was a diarrhea or a tendency in that direction that lasted for several weeks, longer in some. There are exceptions to all rules and statements, but if we continue to make lateral anastomoses we can expect to have such trouble as Dr. Clark has described, and as others have mentioned. If we have a blind end beyond the anastomotic opening, we can expect that blind end to become distended and when it becomes distended the patient will have colicky pains, and we will have to go back and change what we have done. I can understand why a lateral anastomosis is the method of choice because we have not considered it carefully enough to realize that we can do an end-to-end anastomosis just as safely, if we do it in the proper manner, as we can side-to-side anastomosis. We resort to side-to-side anastomosis because we can get serous surface throughout. We can also get serous surfaces throughout by end-to-side anastomosis, and when we do lateral anastomosis, not where we short circuit, but in many instances where we do lateral anastomosis, we are doing a triple operation. We have to close two open ends and make the anastomosis, and the closure of the two open ends is just as simple in the majority of instances as it is difficult under exceptional circumstances, and in every case it is a real source of danger.

You will pardon me for using the blackboard. Let this section represent the large intestine (indicating), and this the incision we make for anastomotic purposes, and then let this diagram represent separation of the peritoneal coat from the muscular, and we have something like this (indicating). This is what we are afraid of, that portion of the small intestine which is extraperitoneal, but if we take and hold the small intestine flat, either with Allis forceps or with sutures, we can take and make a seroserous row of sutures half the way around just as we do in gastro-enterostomy or in lateral anastomosis, getting a good bite over at that point and then making a through-and-through suture just as we do in gastro-enterostomy or in lateral anastomosis and continue the through-and-through suture around, and then ending up with a seroserous suture. We find that the line of suture is just as safe as in a lateral anastomosis and we forego the closing of one opening. We save the time consumed in the one opening.

The experiment I wish to call attention to is this: We made an ileorectoscopy in a dog; we made the communication especially large, and then we divided the colon at the splenic flexure, brought it out obliquely through the abdominal wall, making it pass through the rectus muscle; in other words, offering such obstruction to the outflow of the contents as we could without really closing the opening, and we found we had then an artificial anus and a natural anus. We found everything passed on beyond the anastomosis through the ileocecal valve, all through the ascending colon, the transverse colon, and out past the obstruction instead of the shorter way through the anus.

Dr. J. Garland Sherrill, of Louisville, Kentucky.—I want to say a word or two with reference to Dr. Reder's paper. In reference to the mortality following resection of the bowel for carcinoma, I want to retract some remarks I made in reference to enterostomy as a life-saving measure. The cases of resection of the bowel for carcinoma where obstruction was present at the time of operation, have done best in my hands when subject to the two-stage operation; in other words, I have made an enterostomy and subsequently have closed the opening after the patient has recovered from the primary operation. It seems to me, the danger in these cases especially is the toxic content of the bowel, notwithstanding the fact that you empty the bowel as much as possible and free if from this content, you will have a certain amount of toxemia present,

and if you make an opening and allow this to drain continuously, the patients will do better.

Recently I opened an abdomen six months after a resection for carcinoma at the transverse colon and found that the patient, who had almost died at the first operation, and would have died had I completed the anastomosis, had made a recovery, and had become fat, and I was enabled to close and restore the gut and give him a chance to go to complete recovery. There was no recurrence of the carcinoma.

Dr. John Wesley Long, of Greensboro, North Carolina.—I wish to add a few remarks to the discussion of Dr. Clark's paper. In the first place, I want to congratulate Dr. Clark on the judicial attitude he has taken toward the subject which he has so ably presented. I may say further that this is characteristic of all of Dr. Clark's work. The essayist has opened up a subject which in military parlance might be called "the advanced firing line of surgery."

The chief object of a visit to London last summer was to study Mr. Lane and his work. As I stood in his clinic I noticed by my side such men as William J. Mayo, John B. Murphy, George W. Crile, Stuart McGuire, Hubert A. Royster, and a number of other American surgeons, besides many from the Continent. I mention this only to show you that men all over the world are interested in Mr. Lane's work and think it worth while to go and see the man work in his own clinic, see his patients, and study his methods and views.

Mr. Lane gave us every facility for not only seeing him operate, but to see the patients before they were operated on and afterward as well. He had on one morning three colectomies. On this day he had as many as thirty or forty patients for whom he had done either a lateral anastomosis, side-tracking the ileum into the sigmoid, or a complete colectomy. These patients had been operated on all the way from a month to several years. They were brought there for our inspection, and he said to us, "Gentlemen, talk with these people. Ask them any questions you want. Ask them what was the matter with them, what their symptoms were, and what the results of the operations have been." We talked to them freely. We saw patients there for whom he had removed the colon for constipation *per se*, for exophthalmic goitre, for duodenal ulcer, for tuberculosis of the hip-joint, for tuberculosis of the knee, and a number of other pathological conditions.

After leaving Mr. Lane's clinic and visiting a number of clinics on the Continent, I came back and saw the patients that I had seen Mr. Lane operate upon on the first occasion and examined them again. On this occasion I examined a patient who had been sent to him by Sir James Mackenzie with a diagnosis of toxic heart. Mr. Lane removed the colon, of course.

We say that is radical work, and it is radical work. As I went around from clinic to clinic, whenever I had an opportunity to do so, I said to the surgeons, "What do you think of Mr. Lane's colectomy?" And without a single exception, whenever that question was addressed to a man of wide experience, a man of authority, the reply was, "We do not know. We are watching and awaiting results." Not in a single instance was the man or method condemned *in toto*. Every man was holding himself in the attitude of a true student, studying the man, studying his work, and only when I struck some young fellow who had not had much experience along any line of surgery, did I hear Mr. Lane condemned.

I do not want to take too much time of the Association, but simply to say this, the fact that the operation is a radical one is no reason why we should condemn it. I fell just as Dr. Clark does, and I agree with his conclusions in the present status of the work. I have many times removed a portion of the colon, also the side-tracking operation of anastomosing the ileum to the sigmoid, and have obtained good results. I feel this is a class of work that deserves to be studied and investigated to the fullest extent. The time is not yet ripe for the final decision by any means.

Dr. J. Shelton Horsley, of Richmond, Virginia.—I wish to call attention to the fact that the ileocecal fold is often overlooked. It is a vestigial structure and varies greatly in size. I have seen one or two cases in which I think it was partly responsible for stasis. Sometimes when it is long it runs from the last few inches of the ileum to well down on the cecum. It may be caught in adhesions and kinks and in that way produce obstruction. In tying a ligature around the mesentery of the appendix this fold is sometimes caught and dragged down when it is large and well developed, and this may be an important cause of some postoperative trouble. Very frequently the ileocecal fold is a little narrow band that amounts to nothing. When it is well developed and caught in the mesentery of the

appendix, it should be excised and the vessels ligated, thus removing any danger from complications afterward. In the dog a large artery runs from the cecum on to the ileum and partly supplies the lower ileum. In man the blood supply of the ileocecal fold is insignificant.

In regard to anastomosis, an objection to end-to-end anastomosis is that there is a triangular raw surface left where the mesentery separates to enfold the intestine which is easily infected. If that surface is caught, clampled, and tied *before* the bowel is opened, there will be less trouble. If we clamp this area first and tie it off before opening the bowel and before there is a chance of infection, methods of end-to-end union will be much more satisfactory.

Dr. Hubert A. Royster, of Raleigh, North Carolina.—At the risk of being irrelevant and repetitious, I desire again to emphasize a very important factor which is often overlooked, because our attention has been too long focussed upon the right side of the abdomen. I refer to adhesion of the sigmoid as being in most cases the cause of constipation. How few times do we see impaction of the cecum and how many times we see the sigmoid so filled in women that we cannot examine the pelvis without giving an enema. These kinks and membranes, adhesions and veils, which are found upon the *right* side have all been named. We have the Jackson veil, the Lane kink, "cobwebs in the attic." A little farther on the splenic adhesion is sometimes at fault; below we come to the kinking of the sigmoid which—in most cases gives left-sided pain in women, which cannot be explained by any other means, and in my mind it is the important cause of constipation. Very often if a woman does not have this trouble on the left side, which is seldom suspected, the rest of the condition will give her no trouble at all. For many years we have seen, especially in women, left-sided pain which we could not explain by either adhesions in the pelvis or trouble in any other portion of the body. There have been numbers of instances since I first called attention to this matter where men have written to me that after patients had had an ovary removed, some of them hammock operations done, others hemorrhoids operated upon, they were still constipated and still had left-sided pain; but they had reopened the abdomen, found adhesion of the sigmoid, separated the adhesions, and these patients were not only relieved of their constipation and pain, but their bowels

moved regularly, in many cases without a purgative, even while confined to the bed during convalescence. I would emphasize the recognition of this sigmoid adhesion and proper operation by simply cutting the adhesive process across and sewing it up longitudinally so as to lengthen the interval between the sigmoid and broad ligament or sigmoid and side of the pelvis, and to drop it down instead of raising it up.

Dr. R. C. Coffey, of Portland, Oregon.—The question of adhesions is important and has been discussed a great deal lately. On one or two occasions Dr. Rilus Eastman, of Indianapolis, has brought a number of fetuses into the Association, and has shown us that these were probably congenital in a great number of instances, and he had reached the conclusion that probably they were all congenital, that intestinal stasis had nothing to do with their formation. He, therefore, undertook a series of experiments for the purpose of determining and proving this hypothesis. On the contrary, he found in rabbits and other animals that by constipating rabbits with large doses of morphin, he was able to produce these membranes. He is also able to produce this membrane by sewing up the rectum and producing constipation in this way. On the other hand, he had opened numerous rabbits without constipation in a normal state and had failed to find the membrane. I think Dr. Eastman has done as much if not more, than anyone else, to open up this subject.

Dr. Mayo (closing the discussion on his part).—Perhaps I ought not express myself on the surgery of the large bowel, but I cannot refrain from doing so after listening to Dr. Clark's paper. One point comes to my mind which I am not able to prove now, but which I shall refer to, namely, that anastomosis of the ileum to the sigmoid in a child before much of the colon develops will never lead to any trouble from plugging up of the colon, but will nearly always do so in the adult. This point may prove of some value.

The next point is with reference to Mr. Lane and his work. Lane at this time occupies a more enviable position than any other living surgeon in regard to his work. He was the first man to open the jugular vein and wash out the clots in sinus thrombosis following mastoid abscess. He has done more to put bone surgery on the map than any other living surgeon. His work on cleft palate has led to much discussion and to relief of the condition. Mr. Lane's work and methods have

been widely discussed and their influence widely distributed. Adverse criticism has become less of late, particularly in England, which may have something to do with the title of "Sir" which has recently been conferred upon him.

Dr. Reder (closing the discussion).—The two-stage operation is the one of choice for the resection. Even in the face of the more or less serious surgical measures necessary to close the artificial anus. It occurred to me that this modification would eliminate the serious step of again establishing the continuity of the bowel, inasmuch as the vent would close without any surgical measures in three to five weeks. By the method I have described you have access to the large and the small bowel whenever it becomes necessary. Irrigations can be given freely and at any time. In this manner great comfort can be given the patient and the danger of peritonitis through a leakage at the suture line which is usually caused by gas distention, is averted. Flatus and fetal matter can pass off freely.

THE CONSERVATIVE TREATMENT OF UNDESCENDED TESTICLE

By Alexius McGlannan, M.D.
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Although more than thirty years have passed since Schüller (*Annals of Anatomy and Surgery,* 1881, iv, 89) described his operation for bringing the undescended testicle into the scrotum, and although in this time many other observers have reported series of cases and personal experiences, many surgeons still doubt the practicability of the operation, and in dealing with this condition advise excision of the undescended testicle as the operation of choice.

Rawling (*Practitioner,* 1908) is the most prominent advocate of excision as the operation of choice, his conclusion, being based on a study of the results of 120 cases.

Opposed to Rawling we have, on the other hand, numerous reports, including those of Brocha, Bevan, and Coley.

The important questions to be decided regarding this operation are: (1) Is the non-descended testicle worth saving? (2) Is it technically possible to bring such a testicle into the scrotum in a manner that will preserve its vitality? With these points in mind I have studied the histology of undescended testicles removed at operation, the literature on the subject, and the end results of 16 operations in which I have placed the testicle in the scrotum.[1]

[1] These patients came under my care in St. Agnes' and the Mercy Hospitals, Baltimore, between the years 1906 and 1913. During this time there were also admitted to St. Agnes' Hospital four patients

This study is limited to cases of undescended testicles as distinguished from those of malposition of the organ.

The undescended testicle may occupy any position in the normal route of descent of the gland. Three general divisions are made: (1) abdominal; (2) inguinal; (3) pubo-scrotal, these divisions being made by the relation of the testicles to the internal and external abdominal rings. One form may pass into the other according to various circumstances. For instance, a testicle arrested in the inguinal canal may gradually pass down outside the external ring and even into the normal position in the scrotum. This last mentioned result is rarely observed except in childhood. Or, an inguinal testicle may be forced back into the abdomen by external violence or muscular contraction.

In the older literature practically all the attention is concentrated on the occurence of malignant change in an undescended testicle, and consequently excision was the only treatment considered. Later study shows the frequency of malignant disease in undescended testicle to be less than was supposed and nearly always to occur in cases of inguinal retention, where the greater exposure to trauma explains susceptibility to malignant change. As will be shown later, it is in this inguinal form of non-descent that the operative treatment is most successful in securing both normal position and good nutrition for the testicle.

The histology of the undescended testicle varies in wide limits. A very complete study of the pathology of the

with undescended testicles, in whom the organ was not transplanted into the scrotum. In three cases the testicles were excised. All of these were unilateral retentions, occurring in young adults and were complicated by hernia. One of these excised glands contained several tubules showing active spermatogenesis. The others were atrophic. The fourth patient was a child, aged ten years, with a left-sided retention. There was no hernia and at operation a most diligent search failed to reveal the presence of a testicle or vas deferens on the affected side. The cremaster muscle was well developed, but the internal ring was entirely closed. We have had no case of malignant tumor in an undescended testicle.

undescended testicle has been published by Uffreduzzi (*Archiv. f. klin. Chirurg.*, 1913, C. 1151 and CI. 150). He distinguishes four types of undescended testicles: (1) Those with few signs of disturbed development. (2) Those with marked disturbance. (3) Those showing distinct senile retrogression. (4) Those consisting largely of edematous fibrous interstitial tissue.

The changes occurring at puberty in the normal testicle seem delayed in the undescended gland. This is indicated for the most part by the persistence of the interstitial cells in large numbers. In the specimens which I have examined spermatogenesis was observed in 3 of the 7 cases in which the testicle was removed from young adults. This proportion of spermatogenic activity is about the same as that reported by Odirone and Simmons (*Annals of Surgery*, December, 1904), who found adult spermatozoa in 4 of 9 testicles examined, and a few tubules containing spermatogonia in one of the remaining 5 cases. In the remaining cases the histological picture resembled the infantile type of testicle 4 times, and the senile testicle twice.

Imperfect development of a portion of the genital organs in embryonic life gives an abnormal testicle, which does not descend but is retained in the abdomen. With such a testicle the inguinal canal on the same side is usually closed tight, the scrotum atrophied, and the vas and seminal vesicle insignificant. This form of undescended testicle cannot be improved by surgery and seldom requires any treatment. The glandular epithelium, if formed at all, soon degenerates and is absorbed, leaving a fibrous mass to represent the testicle.

On the other hand, there are undescended testicles which have the normal structure of the infantile testicle, but which fail to develop into the adult type when allowed to remain in the abnormal position.

Finally, there are undescended testicles in which spermatogenesis and the other changes characteristic of the

adult form develop at puberty, but in which senile changes resulting in atrophy occur very early, unless the testicle is brought into its normal position.

In the last two varieties the testicle is almost always associated with a congenital inguinal hernia and has a normally developed vas and seminal vesicle. They are usually situated in the groin, or in the abdomen close to the internal abdominal ring. The spermatic vessels and the vas with its blood supply may be contained in a mesentery-like fold of the peritoneum, a persistance of the fetal mesorchium. However, there is no regular relation of position of testicle with histological structure or development, and the abdominal or inguinal gland may be fibrous and entirely undeveloped.

These three varieties are examples of the views of Hunter, of Curling, and of Monod and Arthaud respectively, on the cause of the imperfect function of the undescended testicle.

Whether a gland of the infantile type will develop all of the adult characteristics after transplantation into the scrotum is not certain. The transplantation undoubtedly is a factor in the production of those changes which are associated with the development of secondary sexual characteristics.

It is difficult to arrive at a conclusion regarding the subsequent development of the spermatogenic function in these infantile glands. Experimentally, with dogs, Griffiths (*Jour. of Anatomy and Physiology*, 1893, xxvii) has proved the converse to be true, namely, that when the fully descended testicle is replaced in the abdomen the gland becomes soft and small and never shows active spermatogenesis. Schmidt (*Beitr. z. klin. Chirurg.*, 1912, lxxxii, 36) shows that when the immature testicle is transplanted into the abdomen, it develops to the extent of forming spermatocytes, but then gradually degenerates. In man it is probable that spermatogenesis when developed persists for a short time only and that the testicle rapidly passes into the senile form.

It is generally agreed that the testicular changes incident to puberty are delayed or prevented by the faulty position of the undescended testicle. It is therefore important to transplant such testicles into the scrotum before puberty. Spontaneous descent may occur in young children, but is rare after ten years. It is at this age, therefore, that operation becomes necessary. For double non-descent imperatively so, because unless transplanted, both glands are very likely to remain infantile or become functionless. For single non-descent I think the operation is almost equally important. Disease or injury of the other testicle may occur at any time, and so render it useless, or even require its removal.

After puberty the undescended testicle is unlikely to develop adult characteristics. In most cases even after transplantation into the scrotum it does not develop further, and often atrophies. However, there are cases in which the opposite result occurs. This is proved by the occurrence of active and potent spermatozoa in the semen of individuals in whom both testicles have been transplanted after puberty. In one of my cases the patient was thirty years of age at the time of operation. Both testicles were in the abdomen and were complicated by hernias. Both were brought into the scrotum after division of the spermatic vessels. Eighteen months after the operation the patient became the father of a child. Whether this case is one of those in which the undescended testicle had taken on the changes of puberty and possessed spermatogenic function at the time of operation, or whether the testicle has developed in its present position cannot be decided. This much at least is proved, the operation did not destroy the vitality of the testicles, and a recent report from the patient states that their form has been preserved.

Operating for the relief of undescended testicle we find that the obstacles to our placing the gland in the scrotum consist of adhesions between the structures of the cord and

the vaginal process of peritoneum, with more or less tortuosity and adherence of the spermatic vessels. These barriers must be removed, if the gland is to be placed properly in the scrotum.

Unless the structural shortening of the cord is overcome by division of these contracted tissues, no fixation will retain the testicle in the scrotum. The Bevan operation (A. D. Bevan, *Jour. Amer. Med. Assoc.*, 1903, xli, 718) furnishes a method by means of which we are able to accomplish this end. The ultimate success of the Bevan operation depends on the great factor of safety provided in the blood supply of the testicle. Either the spermatic or the deferential artery alone seems able to supply sufficient nourishment for the vitality of the testicle. Therefore, in cases where short spermatic vessels make a persistent barrier to the transplanatation of the testicle into the scrotum, these vessels may be divided without necessarily destroying the function of the organ.

A description of the operation done in this series follows: After the usual skin disinfection the inguinal canal is is opened as in the hernia operation. The testicle, if situated in the groin, is lifted up and by gentle traction the cord is put on the stretch. The peritoneal covering is incised around the cord as high up as is possible and the spermatic vessels separated by blunt dissection from their peritoneal covering inside the abdomen. The vessels are now straightened out by dividing all adhesions.

In many cases this loosening gives sufficient mobility to the cord to bring the testicle into the scrotum. Should this prove true the tunica vaginalis is turned back over the testicle and the gland is placed in the scrotum. Usually it is necessary to make a pocket for its reception, by pushing the finger or a clamp into the scrotum.

When the testicle is retained inside the abdomen, the peritoneal cavity is opened through the hernial sac, which is usually present, or the wall is incised in the region of the

internal ring. The testicle may be found in the abdomen, with the structures of the cord in the canal; or all the vessels and the vas may be retained in the abdomen. In the former event the testicle is drawn out and an attempt is made to lengthen the cord by division of adhesions, etc., as just described.

With the latter condition it is usual to find a mesorchium, the vessels showing plainly through the peritoneal covering. This mesentery-like structure fixes the testicle to the abdominal wall and must be divided in order to gain sufficient mobility for the transplantation. The testicle with its mesentery is brought out through the wound and the vas with its vessels separated from the spermatic group. The two sets of vessels are easily distinguished, coming from different directions inside the peritoneal fold.

The spermatic vessels are doubly ligatured and divided. The peritoneum is split so as to bring the vas and its vessels with the testicle into the inguinal canal and the scrotum. Enough peritoneum is retained to form a coat for the testicle.

The division of the spermatic vessels removes the greatest factor in the shortening of the cord, and should be done whenever the separation of adhesions, etc., do not give sufficient length to permit the testicle to rest easy in the scrotum. A slight gain may be obtained by shortening the distance from the abdomen to the scrotum. This is accomplished by dividing the floor of the canal down to the deep epigastric vessels. This was done in one case and thereby the spermatic vessels were preserved. I have never been required to ligate the epigastrics and carry the opening of the floor beyond them, as recommended by Davisson (*Surg. Gyn., and Obst.*, 1911, xii, 283), although this maneuver should be considered before resorting to excision of the testicle.

In closing the canal a stitch is taken through the pillars of the external ring and the cord, fixing the latter structure.

In other respects the closure is the usual one made for inguinal hernia without transplantation of the cord.

In my experience the immediate result has been good in all cases and the ultimate result, for periods ranging from three months to seven years, in all cases has been satisfactory. There has been no gangrene of the testicle even in the cases where the spermatic vessels were divided. All the hernias are cured. No testicle has retracted out of the scrotum, and there has been no gross atrophy of the transplanted organ.

All 16 cases were associated with hernia. One hernia was strangulated. The spermatic vessels were divided four times. There were 4 bilateral cases, 3 left-sided and 9 right-sided single retentions. Of this number 10 patients have been examined or heard from during the past two months. The bilateral cases have been watched very carefully and 3 of the 4 have reported. One of them is the adult mentioned above. The two boys were twelve years old at the time of operation. Both were quite undeveloped and showed absence of pubic hair and other sexual characteristics. Both have since developed these characteristics. In one the change occurred very promptly and was marked four months after the operation. The other boy required nearly a year for the change to be noticeable. These boys were operated upon fifteen and twenty-four months ago, respectively. In the earlier operation the spermatic vessels on one side were divided.

The remaining seven cases were operated upon from three months to seven years ago.

SOME UNUSUAL COMPLICATIONS FOLLOWING CRIMINAL ABORTION, WITH REPORT OF CASES

By Rufus B. Hall, M.D.
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Complications following criminal abortion are of such frequent occurrence and so far-reaching in their varied pathology, that they are much dreaded by every physician called upon to treat them.

It is not the purpose of the writer to offer anything new, or call attention to the many dangers and the varied complications following in the wake of these operations, for you are all too familiar with them. But it is to place upon record two cases of unusual complications, each of which required the most serious operation to save the patient's life; also, to make some suggestions looking to early surgical interference, such as vaginal section and drainage in those cases of infection in which the uterus has been perforated, and the early drainage of pus accumulation, with the hope of avoiding more serious complications later.

The writer is convinced from his experience in the management of a large number of these cases, that an early vaginal section and a free drainage will not only save many lives and shorten the period of convalescence, but will also prevent more serious complications, which will certainly follow if pus accumulation is left to be taken care of by nature's process.

Case I.—Mrs. O. L., aged thirty-two years, mother of one child, was seen in consultation with Dr. C. E. Van

Matre, June 9, 1906, the doctor having been called to take charge of the case the preceding day. Inquiry elicited the following history: Menstruation was established when the child was five months of age. The second period came six weeks later, and again in five weeks after that date. When the next period did not recur at the expected time, the patient, fearing that she was pregnant, used domestic remedies for several days, to bring it on, but the period was not established. The patient was a frail, poorly-nourished, small woman, the wife of a laboring man, and did not want another child. She went to a doctor whom her neighbors told her performed abortions. The patient said that he used an instrument inside of the uterus and her description of it was that of a uterine probe. She made four or five visits to his office at intervals of four or five days. At each visit the doctor used the same instrument, but the patient said did not cause much pain, until the last visit on March 5, when he told the patient that he was going to use more energetic treatment, and it would surely bring on her period. This treatment caused the patient great pain and she had great difficulty in reaching her home by street car, which was a mile or more from the doctor's office. When she reached her home, another physician was called and found the patient in collapse. But he was kept in ignorance of the fact that she had consulted or been treated by the abortionist. The patient developed a general peritonitis of a severe type and for many days her life was despaired of. Two or three days after the peritonitis commenced, she informed her physician of the fact of her having consulted the abortionist, and asked him why she did not abort, which she had not done. Neither at any time during the subsequent illness did the patient abort. The subsequent history of the case proved that the patient was not pregnant at the time that she visited the abortionist, and that he perforated the uterus and infected her in his manipulations. These people were like many in the city, and when

they found that the patient did not recover quickly, they discharged their doctor after three or four weeks and sent for another one. This second physician treated the patient for a few weeks and he was likewise discharged. Several physicians had been in attendance and several consultations had been held over the patient. The last consultation was held a few days before the case was seen by the writer. At that time the specialist, who is one of the leading men in our city, is reported to have stated that the patient had a large ovarian tumor in her abdomen. That she also had sepsis, but her present condition was so desperate that an operation was not to be thought of at that time. After this report the husband discharged both physicians and called Dr. Van Matre, and he in turn called the writer. The patient's condition at that time was desperate, having been confined to her bed with sepsis for fourteen weeks. She was greatly emaciated, having a chill every day or two, followed by profuse sweats, pulse feeble and rapid, often reaching 160 and 170 after her chill, with a temperature from 101° or 102° to 104° or higher. The abdomen was as large as a woman at full term of gestation, and appeared much larger in her emaciated condition. By every physical sign one would be justified in saying the enlargement was due to an ovarian tumor. Resonance could be elicited in two small areas only; one over the hypogastric region, $1\frac{1}{2}$ inches by 3 inches, the other on the left lumbar region, $1\frac{1}{2}$ inches by 2 inches. We doubted the presence of a cyst. The contour of the abdomen with the patient on the back was more flattened out than is usual in ovarian cyst. The history was that of infection and it was more probable that the fluid was in the abdomen than that it was a cyst. We advised an operation, as that promised the only hope, yet telling the friends that an operation promised very little. The operation was performed at the Bethesda Hospital, June 11, 1906. An abdominal section was made and $2\frac{1}{2}$ gallons of thin yellow pus evacuated, which was free

in the abdomen. After the cavity had been cleansed, a most interesting condition was observed; all of the intestinal coils were adherent together and to the posterior wall, and not a single inch of the intestinal tract could be recognized as intestine. The uterus had been lacerated at the fundus from one horn to the other, and in this rent there was lodged the great omentum, which was now greatly thickened. The omentum was not adherent to any of the viscera or to the abdominal wall. The only operative procedure inside of the abdomen was the ligation of the proximal side of the omentum and dividing it close to the fundus of the uterus. After lifting the omentum up, with the greatly relaxed abdominal wall, we could better inspect the cavity, and then could be observed slight elevations representing the intestinal coils. There was no pelvic cavity but the fundus of the uterus was projected into the abdomen $\frac{1}{2}$ or $\frac{3}{4}$ of an inch above the surrounding tissues. The whole abdominal cavity was thus a huge pus cavity, which was flushed with very warm normal saline solution and closed with drainage. It was remarkable how the operation benefited the patient. The chills did not recur, the pulse improved, the temperature did not run so high, and when it did rise it did not remain up but for a short time.

The patient improved as well as one could ask from the hour of the operation. She took liquid nourishment only but freely and with a relish. On the second day she passed flatus freely, and had a good bowel movement on the third day, and one on the fourth day following the operation. She felt fine on the fifth day, also on the sixth day, June 17, until the evening of that day. In the night she complained of pain in the abdomen and was unable to pass any flatus at all. The patient had complete obstruction of the bowels from that date until 9 P.M. June 23, a period of six days. She had regurgitant and fecal vomiting on June 18. From our knowledge of the condition of the intestinal tract, I felt certain that the treatment could not be surgical.

I could not conceive how one could hope to successfully deal with the obstruction if the abdomen was reopened. For that reason the expectant treatment was adopted. We resorted to frequent lavage of the stomach, withholding all nourishment from the mouth, with rectal feeding and hypodermic medication as indicated. The evening of the sixth day of obstruction the abdomen was greatly distended, yet the patient appeared to be holding her own for the past three days. The pulse and temperature both were much more satisfactory than before the operation. The family and friends were clamoring for some kind of an operation to relieve her, saying the previous operation did so much, that doctors were able to do everything. We urged no operative interference, believing that we would certainly take away any chance she might have by an operation. Besides, nature might be able to right the difficulty. In the evening of that day she was able to pass flatus, and within a few hours the abdominal enlargement was greatly reduced and the patient was taking albumen water freely and retaining it. From that date she convalesced slowly but steadily, and was able to leave the hospital on July 9, twenty-eight days after the operation. She gradually regained her health, and at the end of seven months she had regained her usual weight and strength. It is now seven years since the operation. The uterus and ovaries are fixed in the pelvis and she remains sterile.

The case is interesting and unique in the writer's experience, in that class of cases in which the uterus has been perforated at attempts at abortion, inasmuch as that the patient could survive so long from infection with pus in the pelvis for so many months, which gradually increased in quantity until the abdomen became so large that it simulated a large ovarian tumor, filling the entire abdomen. Again, that she should have complete obstruction for six days and yet nature should again assert its powers in her behalf. A treatment, however, that the writer would hesi-

tate to recommend for obstruction ordinarily following operation. It is the only case to recover so treated that the writer has any knowledge of. This recovery can be accounted for by the intestinal tract being so fixed by the inflammatory process, as to prevent sharp angulation of the canal when it became distended by gas.

CASE II.—Was referred by Dr. Charles Belt, Batavia, Ohio, February 3, 1913, after an illness of more than two years. The history of the case which follows is a condensed one, giving only the more important points of the case up to the time of that visit. The patient, Mrs. T., aged thirty-eight, mother of one child, aged twelve years. In January 1911, the patient had an abortion followed by peritonitis and severe infection. She was very sick for many weeks, high temperature, great abdominal distention, with irregular chills, followed by profuse perspiration. About ten weeks after the infection there was a free discharge of pus, estimated to be a pint or more, from the patient's bladder. From this time the patient's condition slowly improved. The urine contained a large amount of pus, varying from three to eight ounces in twenty-four hours. The bladder soon became very irritable and caused the patient great suffering from the constant tenesmus. About eight weeks after the first discharge of pus and about eighteen weeks after the infection, the patient's condition was much improved. The abdominal distention was greatly reduced, the pain in the pelvis and the abdomen had about disappeared. The chills did not recur so often; the discharge of pus was less and the sweats were not so profuse. The general condition had greatly improved in the past three weeks. The patient was able to be propped up in bed and was comparatively comfortable, excepting the never-ending bladder tenesmus. After a few days of this apparent convalescence, the pus almost entirely disappeared from the urine. Within two or three days, the pain in the pelvis and abdomen returned. The temperature and pulse rose

and the sweats again became very profuse, with complete loss of appetite. The patient was again very ill. All of the severe symptoms continued for eight or ten days, when the abscess again discharged a pint or more through the bladder. This was followed almost immediately by relief. The patient improved rapidly and within a week or so was again able to sit up. The convalescence appeared to be satisfactory, excepting there was a great quantity of pus in the urine and the bladder tenesmus was very distressing, preventing the patient from securing much sleep. The patient was now able to be up a part of each day. This improvement continued for a period of about seven or eight weeks, when the pus again almost entirely disappeared from the urine. Within a day or two all of the old symptoms returned, showing the effect of pent-up pus. She was again very ill for a period of eight or ten days, when the abscess again emptied itself into the bladder. This was followed by prompt relief of all of the severe symptoms and general improvement. In about five or six weeks menstruation was established for the first time since the illness commenced, more than eight months before. The period continued five days. She continued to menstruate irregularly afterward, periods coming about every three to eight weeks. The duration of the periods varied from five to seven days, the normal period being three to four days. The patient was now able to be up most of the day and direct her household duties. Up to the time of the last relapse, or "bad spell," as she called them, which occurred about January 20, 1913, the history of the case was a constant repetition of the history given above. While the abscess was discharging freely the patient's condition was bearable, yet she was septic at all times. Once every six, seven, or eight weeks the opening would close, to be followed by a week or more of fever, pain, and severe illness, until it again discharged its contents into the bladder. The last attack did not differ from the many which had preceded it, except

that the pus contained some fecal matter. The patient recovered from this attack as rapidly as any which had preceded it, excepting the bladder tenesmus was greatly aggravated. The feces discharged through the bladder rapidly increased in amount. Her suffering from the bladder tenesmus was so great that she for the first time would consider the repeated urgent advice of her physician to submit to an operation for relief. At the time of her visit to me she weighed about 90 pounds, her normal weight being 120 pounds. She was very feeble and was just up a few days from her recent relapse. At the time of the examination the patient said that since her first illness she always had pain in the right side of the pelvis and abdomen, and the urine contained a large amount of pus, excepting during her acute attacks, at which time it was greatly reduced. The urine now contained a large amount of pus and bowel contents. Examination revealed the uterus slightly enlarged, pushed to the left side of the pelvis, and fixed, with a large mass at the right, which, with the uterus, filled the pelvis full, and extended some three inches above the pubic arch. The right kidney was below the border of the ribs and was more than twice the normal size. The left kidney could not be palpated. A cystoscopic examination revealed the bladder contracted and very much inflamed. The left ureteral opening could be easily located, discharging normal urine into the bladder. Near to and in front of the right ureteral opening was a tumor mass as large as the end of the index finger, which proved to be the opening into the bowel and abscess cavity. The right ureteral opening could not be located, which was much regretted, on account of the enlarged kidney on that side. But inasmuch as the kidneys were secreting almost or quite the normal amount of urine, an operation was advised and made the following day.

Upon opening the abdomen there were no adhesions to the abdominal wall. The pelvic cavity and the lower right side of the abdomen were filled with a mass that

included the bladder, uterus, and several coils of small intestine. The fingers could be passed to the left of the uterus, down to the pelvic floor, there being no adhesions on that side. No ovary could be detected. The uterus and the tumor in the right side filled the pelvic cavity. On the top of these were the great mass of adherent coil of intestine. These were separated from the uterus and bladder, inspected, wrapped in gauze and laid aside. The tumor which proved to be a pus tube and suppurating ovary, with a perforated appendix, were removed. The bladder was liberated from its adhesion to the anterior wall of the uterus, and found to be greatly thickened, with a hole in it, through which the thumb could be easily passed. The opening in the bladder, owing to the greatly thickened condition of the bladder wall, was closed very imperfectly with catgut. Turning to the repair of the intestine, there was a large opening into the mass of adherent bowel, through which the finger could be passed. In separating the different coils, four in number, each coil was found to have an opening at the point of attachment to the bladder. These openings were separated from each other at various distances of about twelve to eighteen inches. There was also a large ragged hole in the head of the colon. These were repaired by suture of Pagenstecher's linen. The right kidney was examined and nothing abnormal could be detected, excepting its greatly increased size. The left kidney was normal in size. As mentioned before, there were no adhesions on the left side. There was also a complete congenital absence of the left ovary and tube. It is unusual to have a pelvic abscess open into the bladder. This is the first case that I have observed. The patient had a slow but satisfactory convalescence. She has regained her former weight and strength, and excepting the usual reflexes of the menopause, is enjoying most excellent health.

These cases are interesting as illustrating in a marked degree the tenacity to life in some cases of infection. They

also emphasize the serious and dangerous complications arising in these infectious cases, where accumulations of pus are left to nature in place of being treated by modern surgical methods.

There is no question but that it requires good surgical judgment in the management of infection following abortion, to decide which one should be drained and which one should not be, especially those cases of criminal abortion. In many cases, the patient uses various instruments upon her own person, and not infrequently perforates the uterus in her attempts at abortion, and the danger of infection is very great. Also, I am convinced that not infrequently do professional abortionists perforate the uterus in his attempts at abortion.

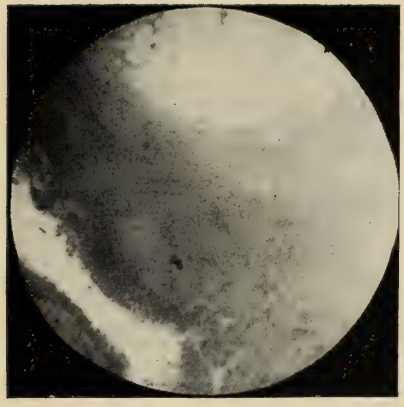
In the treatment of this class of cases in my public hospital work, as well as cases seen in private, for years I have frequently made vaginal section and drainage. In those cases of infection in which we suspect that the uterus has been perforated, and especially if there is an accumulation of peritoneal fluid in the pelvis, the drainage should be established early, not waiting for the formation of pus. In all cases that do not progress satisfactorily after a period of six or eight days from the commencement of the infection, drainage should be considered and the case watched carefully for a pelvic accumulation, and if that occurs drainage should be established at once. In not a few cases there may be three or four weeks elapse from the time of the infection before the accumulation of fluid or pus formation can be made out, but as soon as it can be done drainage should be established. If Case I in the report had been subjected to a vaginal drain within a week or so after her last visit to the abortionist, she would probably have made a prompt recovery after a short convalescence. If Case II had had a vaginal section made three or four weeks after her first infection, she would likewise have recovered with a comparatively short convalescence.

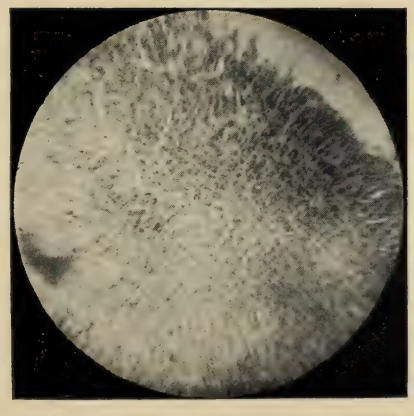
CANCER OF THE BREAST IN A BOY AGED FIFTEEN YEARS

By Robert C. Bryan, M.D.
Richmond, Virginia

One per cent. of all tumors of the breast occur in the male and 2 per cent. of this number are malignant. Poirier, Schuchardt, and Warfield have collected from literature something like 509 cases of carcinoma in the male mammary gland. The age for this condition is apparently a little later in the male than in the female, about sixty years. Trauma is responsible in 13 per cent. of female mammary carcinoma, and in 50 per cent. of the male. Theoretically the right should be involved more often. Both the right and the left breast, however, are apparently affected with the same degree of frequency, despite occupation, as instanced in shoemakers, engineers, etc.

Age.	Males.	Females.
Twenty to twenty-five years	2	0.6
Twenty-five to thirty	2	4.0
Thirty to thirty-five	9	6.0
Thirty-five to forty	12	14.0
Forty to forty-five	11	16.0
Forty-five to fifty	17	20.0
Fifty to fifty-five	15	15.0
Fifty-five to sixty	12	10.0
Sixty to sixty-five	7	9.0
Sixty-five to seventy	3	3.2
Over seventy	10	2.2
Mean average	50	48.0
Earliest	20	22.0
Latest	82	84.0
Total number of cases	90	500.0





It will be seen from this table that the average age at which the disease originates in males is two years later than in females.

It is further noticeable that a relatively large number of the male cases begin after seventy years of age. In most other respects there is remarkable similarity as to the age distribution in the two sexes.

Williams (W. R.). "Cancer of the Male Breast Based on the Records of One Hundred Cases, with Remarks," *Lancet*, 1889, vol. ii, p. 261.

The two greatest extremes in age of cancer of the breast that the writer can find in literature are the following:

Lunn (J. R.). A man, aged ninety-one years, admitted into Marylebone Infirmary May 22, 1896. A shoemaker. Pain in left breast ten months before admission, due possibly to friction of braces. Small scab formed around the nipple. Three months before admission lump in the left axilla. Fungating growth involving nipple and 1 inch of area. Breast and glands removed. Wound healed by first intention. Death a few days after operation from hypostatic congestion of the lungs. No postmortem allowed.

There were also secondary glandular deposits, rare in cases of duct carcinoma. "Case of Cancer of the Breast in Man, Aged Ninety-one Years," *Trans. Pathological Society of London*, 1897, vol. viii, p. 247.

Blodgett (A. M.). This operator reports that his attention was called to a boy, aged twelve years, who was born of healthy parents and in whom no suspicion of malignant heredity could be found. Up to the age of twelve years this boy presented no indication of glandular or other disease. Soon after this time a swelling was noticed in the left breast, beneath and attached to the nipple, which was slightly reddened and harder than its fellow of the opposite side. The swelling and induration gradually increased in size during the succeeding months and the skin became more extensively adherent. After a short period of observation

an operation was performed. The growth on microscopic examination presented the typical structure of carcinoma, and had invaded all visible glandular tissue of the breast. The wound healed by first intention and there has been no indication of recurrence or metastasis since the operation was performed five years ago (Blodgett, A. M., *Boston Medical and Surgical Journal,* 1897, cxxxvi, 611.)

The case which the writer wishes to present is that of A. C., aged fourteen years, eight months. Operated on February 6, 1913. In August, six months before operation, the boy, while playing golf was struck a violent blow on the right breast at about the nipple by a golf ball in flight, which left its impress and made him quite sore for several days. He soon got over the soreness, and paid no further attention to it; five months later, in January, while bathing, noticed a little lump under and very close to the right nipple. It was not painful, but recalling the blow he received, his family decided to have the tumor investigated. On examination the boy was found to be an excellently developed specimen, five feet two inches, weighing 116 pounds, erect in figure, and enjoying the best of health. The family history is negative throughout. Heart and lungs negative. Urinalysis negative. Blood count of no peculiar interest. A small, round, hard tumor about the size of the smallest cherry-stone, was found in the lower right quadrant about one-eighth inch from the nipple, freely movable under the skin and on the underlying fascia.

The nipple was the same as on the left side; there was no retraction, no dimpling. The skin over the tumor showed nothing unusual, and the most careful investigation of the glands in the axilla and about the clavicle and the inguinal region gave no evidence of their enlargement. In the last week the growth had been handled and palpated considerably, and consequently was a little tender.

Under general anesthesia a semicircular incision was made under the breast, the flap dissected back, the tumor

and surrounding fascia were removed down to the pectoral muscle, and the wound brought together without drainage, the patient leaving the hospital in three days. A report by Dr. S. B. Moon, pathologist to Grace Hospital, states that "The specimen, 1014, is adenofibroma, with distinct scirrhous carcinoma in scattered areas of rather active cell proliferation."

The anatomic and pathologic differences between the male and female breast are in degree rather than in kind:

Both develop normally until the beginning of the second decade, when the female breast begins to take on its complex functions and duties, the male to be arrested in growth.

Occasionally there are embryologic dislodgements of subepidermal nodules which may extend into the region of the male breast, histologically impossible to differentiate from carcinoma, yet they are not cancer. The beanlike, submucous nodules found now and then in the appendix belong to this group. They are unquestionably of congenital origin. Aschoff calls them submucous nevi. In the report of Mayo's clinics by McCarty these nodules are called carcinoma of the appendix, and have been observed, according to McCarty, from a boy of nine to a man of eighty years of age. Kelly refers to these in his book.

The diagnosis must be made along identically the same lines as in the female. The same morbid rules obtain. It would appear that tumors of the male breast should be recognized earlier than in the female; small growths are more easily noticed, as they are not surrounded by so much breast tissue. In the later stages, pain, retraction, ulceration, and metastasis conform to the anatomic principles of the female. The prognosis and mortality then should be better for carcinoma of the male breast than in the female. The treatment can be only surgical, complete radical incision.

THROMBOSIS OF THE MESENTERIC VESSELS IN A SCROTAL HERNIA

By Edward A. Balloch, M.D., F.A.C.S.
Washington, D. C.

I thought that I had exhausted the possibilities in the way of complications in hernia until the following case added one more to the list.

The subject of this report was a man, aged forty-five years, who entered the hospital on February 7, 1913. He was an expressman by occupation and stated that he had had an irreducible right inguinal hernia for several years, which had never given him any trouble until a few days before admission, when, after lifting a heavy weight, he had suffered from pain and discomfort for which he sought relief. At the time of admission his pulse was 116 and his temperature 99° F. Examination showed a right scrotal hernia, 15 x 8 cm., irreducible. Tympanites was present in the upper part of the hernia, while the lower half was dull on percussion and had a doughy, semi-elastic feel. The abdomen was tympanitic and waves of peristalsis could be seen passing across it from left to right, going down into the hernial sac. This fact was demonstrated several times. There was no vomiting or other sign of obstruction at any time. The notes show that he felt comfortable and slept well. He took the ordinary ward diet without apparent discomfort. The dull area was aspirated with a hypodermic needle and bloody fluid obtained. Diagnosis, hernia with associated hematocele. It was thought that the lifting

had caused the rupture of a vessel within the sac, causing the hematocele.

Operation, February 10. When the sac was opened it was found that the dull area corresponded to a portion of the small intestine from which the circulation had been cut off for a distance of a half meter. This portion of the gut was pultaceous and verging on gangrene. The ileum was enormously distended, but its walls were in a state of chronic thickening, showing that this condition was an old one and not due to acute distention. There was no constriction at either ring and the distended intestine passed freely into the upper part of the sac, thus eliminating strangulation as a factor in the case. The gut was adherent to the wall of the sac, which accounted for the irreducibility of the hernia.

The affected gut was removed with a good margin so that the proximal and distal ends of the gut were of nearly equal diameter and an end-to-end anastomosis done.

The patient did well for a few days, when a fecal fistula developed at the site of the operation wound, which was followed, four days later, by a peritonitis, which caused death on February 25, two weeks after operation.

This case was interesting to me for several reasons: (1) The entire absence of signs of obstruction was noteworthy. The tympanites, the patient stated, had been present for a year or more, and the fact that the peristaltic waves could be seen to pass into the upper part of the hernial sac seemed to exclude the possibility of strangulation. The entire absence of vomiting or even of nausea in this case I am utterly at a loss to explain, unless it be assumed that the thrombosis did not occlude the lumen of the gut sufficiently to cause obstruction. It was unfortunate in more ways than one, as it led me to defer operation for two days, greatly to the patient's detriment, I am sure. (2) The association of tympanites with a dull area, the former of long standing and the latter recent, together

with the history of its appearance after lifting a heavy weight, seemed to me to indicate an acute effusion of blood into the sac and to make the diagnosis of associated hematocele a rational one. (3) The method of anastomosis used in this case was not suited to the conditions present. At the time of operation the end-to-end anastomosis seemed warrantable, but I am convinced now that a side-to-side union would have been much better in this particular instance.

OPERATIVE TREATMENT OF ANKYLOSIS OF THE MANDIBLE

WITH A HISTORY OF THE OPERATION AND AN ANALYSIS OF TWO HUNDRED AND TWELVE CASES

By V. P. Blair, A.M., M.D.
St. Louis, Missouri

My object in presenting this subject of ankylosis or chronic limitation of movement of the lower jaw is to emphasize the fact that this is by no means an unexplored field, and that sufficient work has been done and a sufficient number of cases have been reported to standardize the treatment of the various groups of cases of this class. Both our review of the literature and observations made upon our own cases have convinced us that practically all of these can be relieved, and that when properly operated this relief is permanent, restoring an open mouth and a functional lower jaw. The advanced age at which some of these cases present themselves, and the length of time the ankylosis has persisted, would alone be sufficient reason for a broad presentation of this subject.

In this presentation I will take up certain points as exemplified in the general literature, citing our own cases and ideas only when they are pertinent.

Age of the Patients and the Duration of the Fixation. In the reported cases the ages at which the patients were treated varied from twenty-two months to fifty-seven years. A little over 25 per cent. of these patients were

ten years or under, while half the remainder were over twenty years, and cases between thirty and forty years are by no means rare. Our youngest operated case was five years old at the time we did a double excision of the condyles. The oldest was about sixty years when he came for treatment.

Exciting Cause and Age at Which it Occurred. The age at which this took place varied considerably, but in the great majority of cases where the age was given it was under ten years. In one case injury at birth was the supposed cause. By far the most common single cause was trauma; this accounting for nearly 50 per cent. of all cases. The great majority of these injuries were not open wounds, and by far the most common form of injury was a blow or fall on the chin. L. W. Orlow ("Ankylosis Mandibulæ Veræ," *Deutsche Zeitschr. f. Chir.*, 1902–03, lxvi, 399–508) found that in one hundred and four cases which he analyzed that only 29 per cent. were caused by trauma, but this does not correspond to the findings in a review of all reported cases.

Next to injury comes scarlatina, usually with suppuration in or about the joint, which accounted for about one-fifth of all cases.

Next in frequency is suppuration in or about the joint or otitis media, the specific cause not being stated. In a few cases the suppurative focus started about a tooth. Among the other infectious diseases typhoid was the most prominent factor, but pneumonia, measles, variola, diphtheria, syphilitic ulceration, and undiagnosed febrile disturbances are mentioned in different cases.

In one of our cases the exciting cause was, in all probability, a gonorrheal arthritis, as the child had a gonorrheal ophthalmia at the same time as the arthritis. Rheumatism and "rheumatoid arthritis" are put forward as causes, while noma and mercurial stomatitis account for a few cases. We have seen several cases with multiple joint

lesions that would come under the heading of hypertrophic arthritis or rheumatoid arthritis.

Character of the Ankylosis and its Clinical Development. In the cases drawn from the literature bony ankylosis would be inferred as the cause in the great majority of the cases. Next in frequency are fibrous bands in the joint, while cicatricial bands in the cheek come next. In one case a scar band attached to the coronoid process is given as the cause, while in another a tumor attached to the zygoma.

Among our cases two were solid bony ankylosis on one side, and in these cases the coronoid process and condyle were represented by a solid bony mass fused to the base of the skull with no sigmoid notch and no glenoid fossa. In four of them there was a short, close, fibrous ankylosis of the joint with considerable change about the condyle and coronoid. In most the sigmoid notch was entirely absent; the ramus being continued up in its full width, ending in a broad, flat, rough base that was closely attached to a similar flat surface at the site of the glenoid fossa. In two there was apparently less bony change in the joint. In one case there was considerable limitation, due possibly to the dislocation of the interarticular fibro-cartilage. It came on suddenly while an injection was being made for a facial neuralgia, and continued without change. In one case the ankylosis was apparently due to a very large, strong styloid process that impinged the posterior border of one ramus of a receding jaw. Cicatricial bands in the cheek limited the opening in three cases.

The development of the ankylosis has in all of our cases been gradual. There was the injury, or the arthritis, and later it was noticed that the amount of opening was limited. Gradually this decreased until there was complete or almost complete closure. The case of supposed dislocation of the cartilage, cited above, was an exception to this rule. In all, attempts had been made to force the mouth open, and while

these may have been for a time partially successful, their result was only temporary. There seems to be a strong tendency, for what at first must have been a simple fibrous ankylosis, to turn into a complete or almost complete bony ankylosis. Where the ankylosis was due to changes in the joint that occurred during the growing period there was always a lack of development of the lower jaw with a receding chin. This has been cited by Cryer and a few others, and was noted in five of our cases. The cause of this is not clear. If it were due directly to the destruction of one epiphyseal cartilage it would appear that the lack of development in a unilateral ankylosis should be unilateral but this has not been the case. Another possibility that has suggested itself, is that abnormal strain of the hyomandibular muscles in their strenuous efforts to open the mouth may have influenced the shape of the jaw.

Symptoms.—The chief symptom is the inability to open the mouth freely. There may be a limited opening or the mouth may be absolutely closed. In the latter case the mouth is apt to be foul and a solid mass of tartar may cover the buccal surfaces of the upper and lower molars continuously. If there is a somewhat close unilateral fibrous ankylosis, as the mouth opens the chin deviates to the ankylosed side. The reason for this is that while the attempt is made to open the mouth the condyle on the unaffected side travels forward on the articular eminence; while on the ankylosed side there is only a slight twisting of the ramus on its long axis. This is very distinct, and before the days when the *x*-rays was adequate for showing the condition of the joints, we were able by it to definitely determine which joint was affected. The recession of the chin in early ankylosis has already been referred to. The general health is usually impaired.

Treatment. The simplest form of treatment and one that has been resorted to in probably all cases is the forceful distention of the opening. It may be done gradually with

a dilator, rubber, or pine wedges, or with laminaria tents. The dilatation may be done forcefully under an anesthetic. In one reported case gas was administered an incredible number of times. However, the review of the literature and our own observation lead us to conclude that simple dilatation is for one reason or another rarely satisfactory. It can do no good in bony ankylosis and unless it is persisted in for an indefinite period it will be of no permanent advantage in the ordinary close fibrous ankylosis or when there are dense scars in the cheek. In simple, light joint adhesions dilatation may be all that is needed.

In considering the operative treatment we must distinguish between cases where the joint is affected directly and those in which the limitation is due to scars in the cheek that bind the upper to the lower jaw, though an Esmarch operation is designed to relieve both conditions. For cheek scars which are usually confined to the mucous surface probably the first method attempted was the simple division or excision of the bands, but this is not efficacious for the bands soon unite again or new scar forms at the site from which they were excised.

Esmarch, in 1855, before the Congress at Göttingen, proposed his operation which consists of the excision of a wedge-shaped piece of bone, three-quarters of an inch long, from the body of the jaw in front of the binding scars. This gives a good functional result, but is not the best means at our disposal.

In 1862 Clendon, of the Westminster Hospital of London, devised a pair of silver shields that fitted over the molar teeth and had flanges which extended down into the reëstablished bucco-alveolar *cul-de-sac*. These were used to protect the teeth while wedges were being inserted and the flanges seemed to prevent the scar bands from becoming directly re-attached to the jaw.

Dr. J. Ewing Mears, of Philadelphia, divided scar bands by surrounding them with a ligature which was tightened

each third day. By this means and with dilatation he got an opening of three-quarters of an inch.

Brophy has inserted a ring through the tissues surrounding the scar band as has been recommended for pharyngeal adhesions, later cutting the band at the site of the ring after the ring tract has epitheliated.

It would seem most reasonable to excise the scar bands and replace them with soft epithelial tissue. This has been done with strips of mucosa obtained from within the mouth, but these strips may not be easily obtainable. A plan which we have used repeatedly where the mucous lining of the mouth was deficient, and applied with a satisfactory result after the excision of limiting scar bands, is the transplantation of a skin flap from the neck attached by a pedicle and brought into the mouth through an incision in the lower fornix of the cheek. The flap is sutured in place and ten days or two weeks later the pedicle is cut and the defect in the upper part of the neck repaired (detailed description of this method is given in Blair's *Surgery and Diseases of the Mouth.* The skin, which must not be hair-bearing, adapts itself kindly to the new situation and it seems the most reasonable and satisfactory method of dealing with extensive intra-oral scar bands.

Busch (*Deutsch. med. Woch.*, 1907, xxxiii, 185) reports a case in which Körte repaired the defect left after excision of scar bands, by means of flaps obtained from within the mouth. Murphy (*Surgical Clinic,* June, 1913, No. III, ii, 405) has reported a similar case. It would seem probable, however, that this method is applicable only to those cases in which the bands were confined to the posterior part of the cheek.

For ankylosis directly affecting the joint, that will not yield to simple dilatation (and in few cases will dilatation be permanently effectual), an excision of the joint or the removal of a section from the body of the ramus will be necessary. (Spanton once divided scar bands around the

FIG. 1.—A normal condyle in the glenoid fossa.

FIG. 2.—A normal condyle rising on the articular eminence; mouth partially opened.

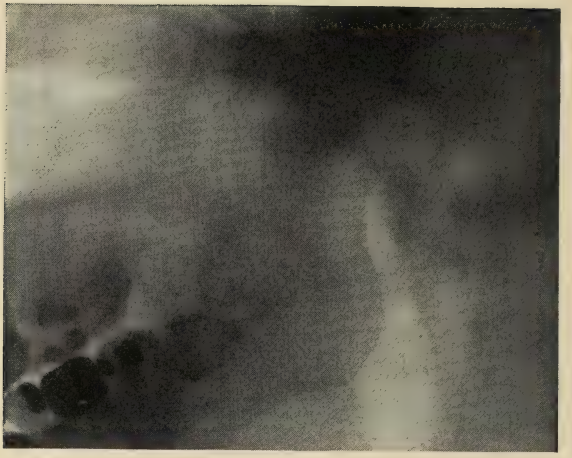


FIG. 3.—Close fibrous ankylosis with excessive periarticular exostosis. True bony ankylosis gives somewhat the same pictures.

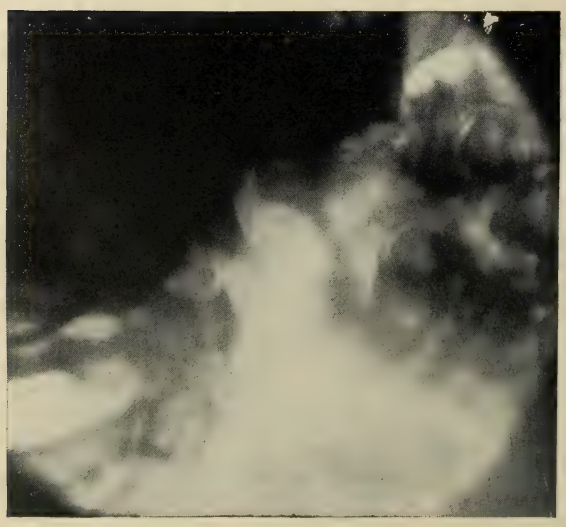


FIG. 4.—Close fibrous ankylosis of the whole of the upper end of the ramus. The sigmoid fossa has disappeared.

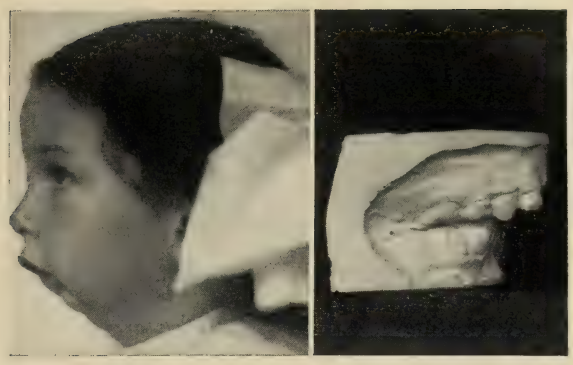


Fig. 5.—Profile and dentures of a child five years old who had a double fibroösseous ankylosis existing for two years, showing the retraction of mandible. Reconstruction of both joints two years ago, and though there is a fair amount of opening, there seems to be little development of the mandible.

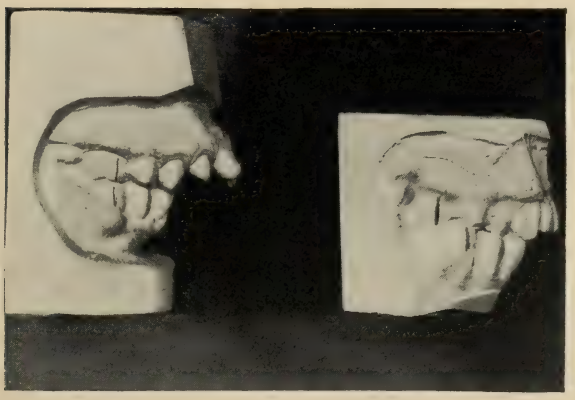


Fig. 6.—Plaster reproduction of the dentures showing the relation of the jaws in a case of close fibrous ankylosis during the growing period and the amount of correction of the mandibular retraction that was accomplished at the time of the operation for ankylosis.

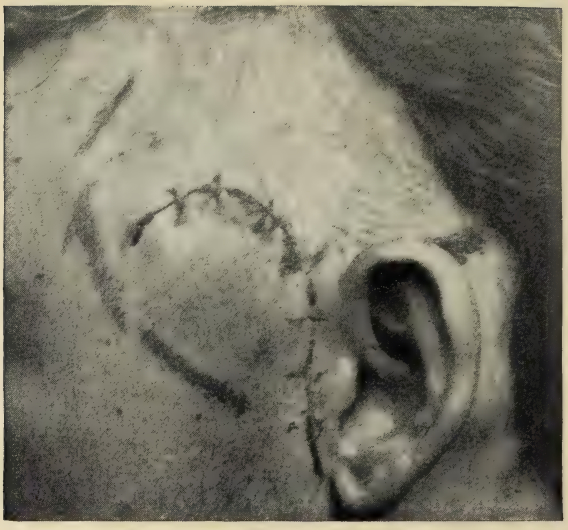


Fig. 7.—The author's incision for reconstruction of the mandibular joint. The heavy lines show the amount of anesthesia resulting. There is also paralysis of the occipitofrontalis muscle.

Fig. 8.—Showing the result of excision of an ankylosed joint. The oblique shearing off of the anterior upper part of the ramus facilitates free movement.

Fig. 9.—Shows the condition resulting from ankylosis during the growing period and the result of the operation with transplantation of cartilage into the chin. She has a permanent opening 1 inch, two years later.

Fig. 10.—Shows the condition resulting probably from noma, the jaws being bound tightly together by scar tissue; and the result of a plastic operation and transplantation of a flap from the neck to replace the scar tissue inside of the cheek.

FIG. 11.—Shows scar brands in both sides of the cheek binding the jaws together. A double transplantation from the neck was done.

joint subcutaneously with a tenatome, but the ankylosis returned.)

Esmarch's operation, which is the excision of a fair-sized piece of the full thickness of the bone at or in front of the angle, was one of the first to attract general attention and is still popular. For further historical data, see note and chart at the end of the paper.

The more rational one, but one more difficult of execution has been credited to Bottini (*Giornale dell' R. Accard. di Medicina de Torino,* 1872, series iii, xi, 549), and consists in the removal of the condyle or the condyle and coronoid process when both are involved; often there is but a mass of bone uniting the ramus to the base of the skull.

George Murray Humphrey in 1854 (*Association Medical Journal,* London, 1856) excised the condyle for a diseased condition of the process that was distorting the jaw.

Excisions from or sections through any part of the ramus or body have been made but unless a considerable piece of bone is removed or unless some material is interposed between the cut ends these may reunite. Various materials have been used for insertion between the bones, metal, gutta percha, rubber plate, neighboring muscle tissue or foreign animal membrane. We have always used a flap of the subcutaneous temporal fascia and believe it admirably adapted to the purpose. The method of approach has varied somewhat. For operating near the angle or on the lower part of the ramus the incision is usually made along the lower border of the jaw and the posterior part of the ramus. For approaching the neighborhood of the joint, numerous different incisions have been used. The chief essential of the incision is that it renders the joint accessible and that it does not destroy the nerve supply to the orbicularis palpebrarum. In the operation we employ, we have found it impossible to preserve the nerve supply of the anterior belly of the occipitofrontalis muscle.

In general the incisions that have been employed, as

given by L. W. Orlow (*Deutsch. Zeitsch. f. Chir.*, 1902-03, lxvi, 399) are: (1) Verticle incision first used by Bottini; (2) horizontal; (3) Bassini's arched incision with convexity forward and downward; (4) Alexander's tongue-shaped incision over the masseter muscle; (5) incision, one part verticle in front of the ear, the other parallel to the zygoma; (6) Humphrey's upper angle incision; (7) Abbe's lower angle incision; (8) Hidrich's and Cabot's cross incisions. (9) Kraske's combined arched and horizontal incision. Mears divided the ramus above the last molar from within the mouth and twisted out the upper fragment. The incision which we have employed in all of our cases differs somewhat radically from those presented elsewhere and has the advantage that it is almost completely within the hair-line and allows of the making of a properly fashioned flap of fat tissue for the construction of the new joint. The skin flap, with a very little subcutaneous tissue, is turned downward and forward. Then a similar flap is made of the subcutaneous tissue down to the temporal fascia; this latter should contain the trunks of the temporal artery and vein uninjured. The parotid gland containing the branches of the seventh nerve, and the masseter muscle are stripped downward *en masse* with an elevator, the side of the joint and the upper part of the ramus are exposed, the condyle, coronoid, and upper part of the ramus are removed with burrs, biting forceps, and chisel until there is a space of three-quarters of an inch between the ramus and the skull. Next, the fat flap still attached at its base is sutured to the now-exposed internal pterygoid muscle, so that it rests between the cut portions of bone. The skin flap is sutured in place and a rubber dam drain is let out through the lower part of the wound. After cutting the bone the mouth is forced open with a specially constructed dilator. If the mouth will not yield sufficiently then the operation must be repeated on the other side. We have had but one case of double ankylosis, although in one case, a patient aged

thirty-five years who had had a complete unilateral ankylosis for fifteen years, the good joint was very stiff and required careful stretching with considerable force. In another case while attempting simple dilatation we fractured the jaw at the site of an unerupted third molar and later after the fracture united we excised the ankylosed joint. Though it causes the patient some discomfort we prefer to dress the mouth open for a week.

This operation, which we presented at the St. Louis Medical Society in 1910, we have employed in five cases and the results are such that we have no inclination to modify it in any essential detail, except where there is excessive recession of the chin. In the latter case the operation, as described above, is done on the ankylosed side and on the other a simple subcutaneous section of the ramus is done with a Gigli saw. Then the body of the jaw is drawn forcefully forward and held in this new position by wiring the lower to the upper teeth. These wires remain in place twelve weeks. Later gradual stretching of the new joint is done with rubber wedges or bottle stoppers. In two cases we have rounded out a deficient mental eminence by implainting a section of costal cartilage in the soft tissues of the chin.

Results. The immediate result where the mouth was dressed open was an opening of three-quarters to one inch. By the use of a rubber bottle stopper this opening is preserved or even increased in the nest two months; later the opening gradually increases until it may reach one and a half inches. In a child of five years, with a double ankylosis, we were unable to get more than three-quarters of an inch opening and a rubber dilator had to be used a long time to maintain this but I believe in time this will increase. In some of the reported cases greater openings have been obtained. According to Orlow (*Deutsch. Zeitsch. f. Chir.*, lxvi, 399), in cases analyzed by him, there have been recurrences in 12 per cent. of cases, but many operations in the

past have been very inadequate. If we were to include operations which consisted simply in stretching the adhesions and fibrous bands, the number of recurrences would be much nearer to 100 per cent.

The objects of the operation are to allow the mouth to open sufficiently for function, to restore the lateral or grinding motion of the jaw and to allow inspection and cleansing of the mouth. Not the least part of the suffering of these patients is from toothache. An opening of half an inch is not sufficient for any of these purposes, but add just a little more and all of them can be carried out fairly well. A gentleman, at the age of about sixty, was sent to me because of an ankylosis that permitted an opening of eighteen-thirty-seconds of an inch, and which caused him great annoyance. With the help of Dr. J. A. Brown, of this city, we constructed a pneumatic dilator which his dentist used intermittently for about one year and got a permanent opening of three-sixteenths of an inch more. With this "he is able to eat bread and butter without getting it all over himself" (quoted from his dentist's letter). This case is cited simply to show how much a slight gain on the measuring stick may really be in function.

Mishaps and Complications. Aside from simple wound infection the most common postoperative complication is a temporary paralysis of the whole or a part of the seventh nerve. In the incision we describe the branch to the occipitofrontalis muscle will be cut and the patient will be unable to wrinkle the forehead on that side. This has been permanent in our cases. A more general affection of the nerve has frequently resulted from stretching or from wound infection, but this usually passes off in five weeks. In one case we injured some fibers of the orbicularis palpebrarum and the patient was unable to close the eye completely for several months but finally recovered. One operator divided the trunk of the seventh nerve and had a permanent paralysis. This would seem to be an almost

unnecessary accident. In several cases tracheotomy had to be performed during the operation and several operators have done it before attempting the operation. While we have always been prepared to do a tracheotomy, we have so far not found it necessary.

In conclusion, it is our belief that, except in comparatively few cases, simple stretching is not a permanent nor an adequate relief for ankylosis of the jaw; but that a properly performed operation will give permanent relief with a minimum of discomfort and with very little risk to life and with great benefit to the patient.

KEY TO LITERARY REFERENCES.

1. Name and reference.
2. Age and sex.
3. Date of operation.
4. Duration of ankylosis.
5. Predisposing cause.
6. Character of ankylosis.
7. Pre-operative opening and movement.
8. Previous treatment.
9. Occlusion before operation.
10. Operation.
11. Mouth dressed open or closed.
12. Complications.
13. Result.

SPECIMEN I.

CASE I.—1. Rochet, Arch. prov. de Chir., vol. v. 2. 10, M. 3. July 3, 1894. 4. 2 (?) years. 5. (?). 6. Bony, left. 7. 0.5 cm. between incisors. 8. (?). 9. (?). 10. Wedge of bone removed and muscle implanted. 11. (?). 12. None. 13. Recurrence.

CASE 2.—1. Rochet, Arch. prov. de Chir., vol. v. 2. 9, M. 3. September 19, 1895. 4. 2 years. 5. Fall on chin. 6. Bony, left. 7. Few mm. 8. (?). 9. Atrophy of jaw. 10. Bone section of ascending ramus. 11. (?). 12. None. 13. Good.

CASE 3.—1. Rochet, Arch. prov. de Chir., vol. v. 2. 24, M. 3. (?). 4. 8 months. 5. Gonorrheal rheumatism. 6. Bony, left. 7. 0.5 cm. 8. (?). 9. (?). 10. Bone section, muscle implanted. 11. (?). 12. None. 13. 3 cm. opening.

CASE 4.—1. Hartley, Annals of Surgery, April, 1911. 2. 10, F. 3. January 5, 1909. 3. March 6, 1909. 4. 6 months. 5. Diphtheria

and scarlet fever. 6. Bilateral, bony. 7. None. 8. (?). 9. (?). 10. Bone section on right side. 10. Bone section on left side. 11. (?). 12. None. 13. Good motion.

Case 5.—1. Hartley, Annals of Surgery, April, 1911. 2. 17, M. 3. May, 1910. 4. 4 months. 5. Fracture. 6. Right bony. 7. ½ inch. 8. (?). 9. (?). 10. Excised condyloid process part of zygoma and temporal bone. 11. (?). 12. None. 13. Open 1¾ inch.

Case 6.—1. Hartley, Annals of Surgery, April, 1911. 2. 40, M. 3. (?). 4. 6 years. 5. Injury. 6. Bilateral, bony. 7. (?). 8. (?). 9. (?). 10. Bone section. 11. (?). 12. None. 13. Open 2 inches.

Case 7.—1. W. J. Roe, Annals of Surgery, August, 1903. 2. 18, M. 3. December 2, 1901. 3. December 9, 1901. 4. 10 years. 5. Fracture. 6. Bilateral, bony. 7. 0.1 cm. 8. (?). 9. (?). 10. Callus removed on right. 10. Callus removed on left. 11. (?). 12. Temporary facial paresis. 13. Open 1¼ inch.

Case 8.—1. W. J. Roe, Annals of Surgery, August, 1903. 2. 18, M. 3. (?). 4. 13 years. 5. Injury. 6. Bilateral, bony. 7. 0.3 cm. 8. (?). 9. (?). 10. Callus removed. 11. (?). 12. Tracheotomy 13. (?).

Case 9.—1. Mason Swain, Med. Times Gaz. 2. 29, F. 3. (?). 4. 16 years. 5. Scarlet fever. 6. Right bony. 7. None. 8. Forced under anesthetic. 9. (?). 10. Bone section. 11. (?). 12. None. 13. Good.

Case 10.—1. Spanton, Lancet, 1881. 2. (?). 3. April, 1880. 3. April, 1881. 4. (?). 5. (?). 6. Bilateral fibrous. 7. (?). 8. (?). 9. (?). 10. Division of external lateral ligaments. 10. Similar. 11. (?). 12. None. 13. Recurred. 13. Fair.

Case 11.—1. Spanton, Lancet, 1881. 2. 9, F. 3. November, 1879. 4. (?). 5. Scarlet fever. 6. Bony. 7. (?). 8. (?). 9. (?). 10. (?). 11. (?). 12. None. 13. Able to eat.

Case 12.—1. Sidney Jones, Lancet. August, 1894. 2. 13 (?). 3. December, 1883. 3. January, 1884. 4. (?). 5. Injury. 6. Bilateral bony. 7. (?). 8. Gags and plugs. 9. (?). 10. Bone wedge removed on right. 10. Bone wedge removed on left. 11. (?). 12. None. 13. Not good. 13. Open one inch.

Case 13.—1. Richard Davy, Lancet, September, 1886. 2. 50, F. 3. November, 1878. 4. 1 year. 5. Tooth abscess. 6. Left bony. 7. Slight. 8. (?). 9. (?). 10. Excised condyle. 11. (?). 12. None. 13. Died.

Case 14.—1. Richard Davy, Lancet September, 1886. 2. 9, F. 3. February, 1879. 4. (?). 5. (?). 6. Left bony. 7. (?). 8. (?) 9. (?). 10. Excised condyle. 11. (?). 12. None. 13. Good.

Case 15.—1. Richard Davy, Lancet, September, 1886. 2. 47, M. 3. May, 1885. 4. 14 months. 5. Toothache. 6. Left bony. 7. Slight. 8. (?). 9. (?). 10. Excised condyle and neck. 11. (?). 12. None. 13. Open ¾ inch.

CASE 16.—1. Heath, British Med. Jour., 1884, vol. ii. 2. 32, F. 3. May, 1883. 4. (?). 5. Rheumatism. 6. Left bony. 7. (?). 8. Force. 9. (?). 10. Removed condyle, neck and part of coronoid process. 11. (?). 12. None. 13. Satisfactory.

CASE 17.—1. Heath, British Med. Jour., 1884, vol. ii. 2. 32, F. 3. March, 1883. 4. 24 years. 5. Injury. 6. Right bony. 7. None. 8. (?). 9. (?). 10. Removed bone wedge. 11. (?). 12. None. 13. Fair.

CASE 18.—1. Heath, British Med. Jour., 1884, vol. ii. 2. 10, M. 3. December, 1883. 4. 8 years. 5. Injury. 6. Left adhesions. 7. $\frac{1}{16}$ inch. 8. (?). 9. (?). 10. Removed part of zygoma and condyle. 11. (?). 12. None. 13. Open $\frac{1}{2}$ inch.

CASE 19.—1. Heath, British Med. Jour., 1884, vol. ii. 2. 9, F. 3. March, 1884. 4. (?). 5. Measles. 6. Left bony. 7. $\frac{1}{12}$ inch. 8. (?). 9. (?). 10. Bone resection. 11. (?). 12. Nerve injured. 13. Open $\frac{3}{4}$ inch.

CASE 20.—1. Heath, British Med. Jour., 1884, vol. ii. 2. 16, M. 3. December, 1886. 4. 5 years. 5. Scarlet fever. 6. (?). 7. (?). 8. (?). 9. (?). 10. Resection of ramus. 11. (?). 12. None. 13 Open $\frac{1}{16}$ inch.

CASE 21.—1. Fred Page, British Med. Jour., 1887, vol. ii. 2. 13. M. 3. May 28, 1887. 4. 4 years. 5. Measles. 6. Left bony. 7. Slight. 8. Gag. 9. (?). 10. Removed condyle. 11. (?). 12. None. 13. Open full extent.

CASE 22.—1. Fred Page, British Med. Jour., 1889, vol. i. 2. 9, F. 3. March 5, 1889. 4. 7 years. 5. Measles. 6. Right bony. 7. Slight. 8. (?). 9. (?). 10. (?). 11. (?). 12. None. 13. Normal.

CASE 23.—1. Barker, Lancet, May, 1893. 2. 15, F. 3. October 9, 1891. 4. 10 years. 5. Injury. 6. Left bony. 7. $\frac{1}{4}$ inch. 8. (?). 9. (?). 10. Removed mass of bone and neck. 11. (?). 12. Temporary paresis. 12. Open $1\frac{1}{4}$ inch.

CASE 24.—1. Heath, Injuries and Diseases of the Jaw. 2. 27, M. 3. (?). 3. 4 months later. 4. 20 years. 5. Scarlet fever. 6. Bilateral bony. 7. None. 8. (?). 9. (?). 10. Wedge of bone removed from right. 10. Wedge of bone removed from left. 11. (?). 12. None. 13. (?).

CASE 25.—1. Humphrey, Jour. Amer. Med. Assoc., January, 1856. 2. 21, F. 3. 1884. 4. 2 years. 5. (?). 6. Right bony. 7. (?). 8. (?). 9. Displaced to left. 10. Removed condyle. 11. (?). 12. None. 13. (?).

CASE 26.—1. Paul Swain, Lancet, July 28, 1894. 2. 22, F. 3. October 11, 1892. 4. 11 years. 5. Scarlet fever. 6. Bilateral bony. 7. None. 8. Operations in 1880 and 1881 (reported). 9. (?). 10. Triangular piece of bone removed from both sides. 11. (?). 12. None. 13. 2 years later, normal.

Case 27.—1. Francis Stewart, Annals of Surgery, March, 1904. 2. 6, F. 3. September 28, 1903. 4. 22 months. 5. Swelling and discharge. 6. Right bony. 7. Complete closure. 8. Sequestrum removed. 9. (?). 10. Excision of bone from joint cavity. 11. (?). 12. Slight palsy of orbicularis palpebrarum. 13. Normal.

Case 28.—1. Willard DeForest, Annals of Surgery, March, 1904. 2. Child. 3. October 19, 1903. 4. 3 years. 5. Injury. 6. Adhesions. 7. None. 8. (?). 9. (?). 10. No incison—steady pressure under. 11. (?).

Case 29.—1. J. Wyeth, St. Louis Med. Brief, February 1903. 2. 34, M. 3. November 19, 1902. 4. 2 years. 5. Injury. 6. Bony left. 7. Complete closure. 8. (?). 9. (?). 10. Removed section of bone $\frac{1}{4}$ inch in width. 11. (?). 12. None. 13. Normal.

Case 30.—1. Howard Lilienthal, Annals of Surgery, August, 1911. 2. 18, F. 3. (?). 4. 8 years. 5. Injury. 6. Bilateral bony. 7. Complete closure. 8. (?). 9. (?). 10. Section of zygoma, removal of neck and condyle on left, 9 days later right similarly treated. 11. (?). 12. None. 13. Perfect in three weeks.

Case 31.—1. D. Hartwell, Annals of Surgery, January, 1907. 2. 17, F. 3. April, 1906. 4. 12 years. 5. Diphtheria. 6. Bilateral bony. 7. Immobilized. 8. (?). 9. $\frac{3}{8}$ inch. 10. Mass of bone attached to zygoma and ramus freed with chisel. 11. (?). 12. None. 13. Normal.

Case 32.—1. Rogers, St. Paul Med. Jour., September, 1903. 2. 2 years 9 months, M. 3. (?). 4. $1\frac{1}{2}$ years. 5. Pneumonia. 6. Left bony. 7. Less than $\frac{1}{8}$ inch. 8. Force under ether. 9. (?). 10. Section of neck, removal of zygoma and V-shaped piece of bone. 11. (?). 12. None. 13. Full extent.

Case 33.—1. Dr. Ries, Illinois Med. Jour., April, 1905. 2. 21, M. 3. November, 1904. 4. 1 month. 5. Syphilis. 6. Bilateral cicatricial. 7. No movement. 8. Antisyphilitic. 9. (?). 10. Left side—resected condyloid process dissected out coronoid process—inserted ivory peg. Right side—resection of condyloid. 11. (?). 12. None. 13. Mobility fair.

Case 34.—1. Mr. Cropper, Lancet, March 5, 1904. 2. 12, M. 3. November 30, 1903. 4. 1 year. 5. Ulcerative stomatitis. 6. Left, cicatricial bands. 7. Clinched. 8. (?). 9. (?). 10. Gag inserted, bands divided with knife, cheek divided where it adhered to gums. 11. Open. 12. Foul mouth, healed. 13. Open 1 inch.

Case 35.—1. Mr. Fitzwilliams, Proc. Roy. Soc. Med., 1911–12. 2. F. 3. November 12, 1911. 3. December 25, 1911. 4. 7 years. 5. Rheumatism. 6. Bilateral bony. 7. $\frac{3}{8}$ inch. 8. (?). 9. (?). 10. Neck of left side divided—bone removed. 10. Ascending ramus on right removed. 11. (?). 12. None. 13. 19 months, 2 inches.

Case 36.—1. Max Bauchwitz, Deutsch. Monats. Zahr. 2. 40, F. 3. September, 1904. 4. 35 years. 5. Tooth extraction. 6. Left

bony. 7. Slight. 8. (?). 9. Inferior maxillary not developed. 10. Removed angle and part of coronoid process. 11. (?). 12. None. 13. 1½ cm. opening.

CASE 37.—1. M. Manclaire, Bull. et Mém. Soc. de Chir. de Paris, 1910. 2. 25, F. 3. February, 1902. 4. 25 years. 5. Suppuration. 6. Bilateral bony. 7. None. 8. (?). 9. Retraction of chin. 10. Resection of condyle and coronoid process on both sides. 11. (?). 12. Facial paralysis for 2 months. 13. 3 to 4 mm.

CASE 38.—1. Nélaton, Bull. et Mém. Soc. de Chir. de Paris, 1910. 2. 12, M. 3. February 23, 1910. 3. March 15, 1910. 4. 3 years. 5. Fracture. 6. Bilateral bony. 7. None. 8. (?). 9. To right. 10. Section of zygoma—removal of bony mass on right muscle interposed. 10. Section of coronoid process and interpolation of muscle on left. 11. (?). 12. Difficult anesthesia. 13. Normal.

CASE 39.—1. A. Demoulin, Bull. et Mém. Soc. de Chir. de Paris, 1910. 2. 15, M. 3. December, 1909. 4. 1 year. 5. Typhoid fever. 6. Bilateral bony. 7. 1 cm. 8. (?). 9. Retreating chin. 10. Removed mass of bone, part of condyle and zygomatic process. Muscle interpolated. 11. (?). 12. None. 13. Open 2 cm.

CASE 40.—1. Auguste Broca, Bull. méd. Paris, 1910. 2. 11, F. 3. Summer, 1909. 4. 7 years. 5. Injury. 6. Right bony. 7. None. 8. (?). 9. Receding chin. 10. Resection of joint. 11. (?). 12. None. 13. Moderate success.

CASE 41.—1. M. Donati, Gior. d. v. accad. di Med. di Torino, 1910. 2. 9, M. 3. December, 1909. 4. 7 years. 5. Otitis media. 6. Bilateral bony. 7. None. 8. (?). 9. Lower jaw receding. 10. Left resection of coronoid process. Right four days later removed mass 3 cm. thick. 11. (?). 12. Grave cyanosis tracheotomy. 13. Good.

CASE 42.—1. F. Kirston, Med. Klin., Berlin, 1908. 2. 18, M. 3. (?). 4. 14 years. 5. Injury. 6. Bilateral bony. 7. 1 cm. 8. (?). 9. Retreating chin. 10. Bony mass removed. Masseter muscle interposed on left. 11. (?). 12. Injured tympanum healed. Hearing normal. 13. 2 cm. opening.

CASE 43.—1. V. Nausemann, Berliner klin. Woch., 1903. 2. M. 3. 1897. 4. All life. 5. Uncertain. Birth injury (?). 6. Bilateral bony. 7. (?). 8. (?). 9. (?). 10. Resection of bone on right side. 11. (?). 12. None. 13. (?).

CASE 44.—1. Carl Roser, Centralblat f. Chir., Leipzig, 1898. 2. 22, M. 3. November 2, 1897. 4. 4 years. 5. Injury. 6. Bilateral cicatricial. 7. None. 8. (?). 9. (?). 10. Excised condyloid process. Gold plate interpolated. 11. Open. 12. None. 13. Open 1.75 cm.

CASE 45.—1. Burch, Deutsch. med. Woch., 1907. 2. 45, F. 3. November, 1905. 4. 1 year. 5. Mercurial stomatitis. 6. (?). 7. 5 mm. 8. (?). 9. (?). 10. Ulcer removed, resection of coronoid process, antrum of Highmore curetted defects covered with plastic flaps. 11. (?). 12. None. 13. 14 months later open 4 cm.

Case 46.—1. Korte, Deutsch. med. Woch., 1907. 2. (?). 3. 1890. 4. (?). 5. Measles. 6. Unilateral cicatricial. 7. (?). 8. (?). 9. (?). 10. Excision of cicatrix, defect covered with neck flap. 11. (?). 12. None. 13. Good.

Case 47.—1. Krause, Deutsch. med. Woch., 1907. 2. (?). 3. (?). 4. (?). 5. Gonorrhea. 6. (?). 7. 2 mm. 8. (?). 9. (?). 10. Resection of joint, interpolation of masseter muscle. 11. (?). 12. None. 13. Good.

Case 48.—1. W. H. Bennett. 2. (?). 3. 1889. 4. (?). 5. (?). 6. Bilateral bony. 7. (?). 8. Double excision of condyles. 9. (?). 10. Double Esmarch operation. 11. (?). 12. None. 13. Permanent.

Case 49.—1. Little, New York Med. News, December 20, 1884. 2. F. 3. 1863. 4. (?). 5. (?). 6. (?). 7. (?). 8. (?). 9. (?). 10. Excision of jaw. 11. (?). 12. None. 13. Good.

Case 50.—1. Pitcher, New York Med. News, December 20, 1884. 2. 4. 3. (?). 4. (?). 5. Salivation. 6. Unilateral cicatricial. 7. (?). 8. (?). 9. (?). 10. Excision of scar; mucous membrane transplanted from lip. 11. (?). 12. None. 13. Fair.

Case 51.—1. Lenox Curtis, Jour. Amer. Med. Assoc., July 2, 1904. 2. 16, M. 3. (?). 4. 13½ years. 5. Fracture. 6. (?). 7. (?). 8. Stretching. 9. Shortening of lower jaw. 10. Refused. 11. (?). 12. None. 13. (?).

Case 52.—1. Lenox Curtis, Jour. Amer. Med. Assoc., July 2, 1904. 2. 14, M. 3. (?). 4. 8 years. 5. Diphtheria. 6. Right fibrous. 7. ⅛ inch. 8. (?). 9. Lower jaw, short. 10. Stretching. 11. (?). 12. None. 13. Fair.

Case 53.—1. A. T. Cabot, Lancet, August 7, 1897. 2. 13, F. 3. 1887. 4. 10 years. 5. Scarlet fever. 6. Unilateral. 7. (?). 8. (?). 9. (?). 10. Condyle chiselled through. 11. (?). 12. Temporary paralysis of orbicularis palpebrarum. 13. ¾ inch opening.

Case 54.—1. A. T. Cabot, Lancet, August 7, 1897. 2. 17, F. 3. 1888. 4. 13 years. 5. Scarlet fever. 6. Left bony. 7. None. 8. (?). 9. (?). 10. Bone section. 11. (?). 12. None. 13. ½ inch opening.

Case 55.—1. A. T. Cabot, Lancet, August 7, 1897. 2. 30, F. 3. 1889. 4. 27 years. 5. Injury. 6. Left bony. 7. None. 8. Stretching. 9. (?). 10. Bone section. 11. (?). 12. Paralysis of seventh. 13. ¾ inch opening.

Case 56.—1. A. T. Cabot, Lancet, August 7, 1897. 2. 32, F. 3. 1889. 4. 26 years. 5. Injury. 6. Right bony. 7. None. 8. (?). 9. (?). 10. Bone section. 11. (?). 12. None. 13. 5 years later—1 inch.

Case 57.—1. A. T. Cabot, Lancet, August 7, 1897. 2. 26, F. 3. 1890. 4. (?). 5. Injury. 6. Unilateral. 7. (?). 8. (?). 9. (?). 10. Bone section. 11. (?). 12. Asphyxia—laryngotomy. 13. Good.

Case 58.—1. A. T. Cabot, Lancet, August 7, 1897. 2. 8, M.

3. 1890. 4. 6 years. 5. Scarlet fever. 6. Single, bony. 7. None. 8. (?). 9. (?). 10. Bone section. 11. (?). 12. None. 13. Normal.

Case 59.—1. A. T. Cabot, Lancet, August 7, 1897. 2. 37, F. 3. 1891. 4. 30 years. 5. Injury. 6. Right, bony. 7. None. 8. Stretching. 9. (?). 10. Bone section. 11. (?). 12. Slight twitching of eye. 13. Open 1 inch.

Case 60.—1. Allingham, British Med. Jour., December 1, 1886. 2. 7, M. 3. (?). 4. Months. 5. Injury. 6. (?). 7. Slight. 8. (?). 9. (?). 10. Removed condyle. 11. (?). 12. None. 13. (?).

Case 61.—1. David Greig, Practitioner, 1889. 2. 12, M. 3. (?). 4. 5 years. 5. Scarlet fever. 6. Fibrous. 7. (?). 8. (?). 9. (?). 10. Removed condyle. 11. (?). 12. None. 13. $\frac{1}{3}$ inch opening.

Case 62.—1. David Greig, Practitioner, 1889. 2. 28, M. 3. (?). 4. 4 years. 5. Scarlet fever. 6. (?). 7. (?). 8. (?). 9. (?). 10. Excision of condyle. 11. (?). 12. Permanent facial paralysis. 13. (?).

Case 63.—1. David Greig, Practitioner, 1889. 2. 10, F. 3. (?). 4. $3\frac{1}{2}$ years. 5. Typhoid fever. 6. Fibrous. 7. (?). 8. Operations. 9. (?). 10. Excision of coronoid process. 11. (?). 12. None. 13. $\frac{1}{2}$ inch opening.

Case 64.—1. David Greig, Practitioner, 1889. 2. 12, M. 3. (?). 4. 7 years. 5. Injury. 6. Fibrous. 7. (?). 8. (?). 9. (?). 10. Excision of coronoid process. 11. (?). 12. None. 13. Good.

Case 65.—1. David Greig, Practitioner, 1889. 2. 30, F. 3. (?). 4. 27 years. 5. Injury. 6. (?). 7. (?). 8. Operation at 20 years. 9. (?). 10. Excision of condyle. 11. (?). 12. None. 13. Good.

Case 66.—1. Goodwillie, New York Med. Jour., July, 1875. 2. 10, F. 3. 1875. 4. 5 years. 5. Injury. 6. Fibrous. 7. (?). 8. Force applied. 9. Retreating jaw. 10. Continuous forced dilatation. 11. (?). 12. None. 13. $\frac{7}{8}$ inch opening.

Case 67.—1. Goodwillie, New York Med. Jour., July, 1875. 2. 21, F. 3. 1872. 4. (?). 5. Tonsillitis. 6. Fibrous. 7. (?). 8. (?). 9. (?). 10. Continuous dilatation for 6 months. 11. (?). 12. None. 13. 1 inch opening.

Case 68.—1. Bruce, Canada Lancet, May, 1898. 2. (?), F. 3. 1897. 3. November, 1897. 4. $2\frac{1}{2}$ years. 5. Fracture. 6. Right, bony. 7. (?). 8. Gag. 9. Displaced to right. 10. Section of neck of condyle (abandoned). 10. Removed coronoid process, portion of ascending ramus. 11. (?). 12. Profound narcosis. 12. Paralysis of orbicularis palpebrarum. 13. None. 13. $\frac{3}{8}$ inch opening.

Case 69.—1. Morton, Canada Lancet, September, 1897. 2. 57, M. 3. October, 1896. 4. 4 years. 5. Arthritis. 6. Bilateral bony. 7. (?). 8. (?). 9. (?). 10. Division of both necks. 11. (?). 12. Paralysis of orbicularis palpebrarum. 13. $\frac{3}{8}$ inch opening—good mastication.

Case 70.—1. Helferich, Arch. f. klin. Chir., 1894. 2. 13, M, 3. 1893. 4. 7 years. 5. Injury. 6. (?). 7. None. 8. (?). 9.

Retracted jaw. 10. Resection of the joint. 11. (?). 12. None. 13. Recurrence.

Case 71.—1. Helferich, Arch. f. klin. Chir., 1894. 2. Child, F. 3. June 29, 1893. 4. (?). 5. (?). 6. Left bony. 7. Slight on right. 8. (?). 9. No chin. 10. Resection of condyloid process, interpolation of muscle. 11. (?). 12. None. 13. Open 2.5 cm.

Case 72.—1. Hedrich, Gaz. med. de Strasbourg, 1891. 2. 11, M. 3. October 15, 1890. 4. 6 years. 5. Injury. 6. Bilateral bony. 7. None. 8. (?). 9. Retreating chin. 10. Bone resection. 11. (?). 12. Fistula cured. 13. Open 3 cm.

Case 73.—1. Hagedorn, Verhandl. d. Deutschen Gesellschaft f. Chir., 1880. 2. 36, F. 3. (?). 4. 6 years. 5. Rheumatism. 6. Bilateral bony. 7. None. 8. (?). 9. (?). 10. Resection of condyloid process. 11. (?). 12. None. 13. Open 2 cm.

Case 74.—1. Samuel D. Gross, System of Surgery, 1882. 2. 7, F. 3. 1884. 4. (?). 5. Rheumatism. 6. Left bony. 7. (?). 8. (?). 9. (?). 10. Excision of condyle. 11. (?). 12. None. 13. Good movement.

Case 75.—1. Gardiner, Australian Med. Jour., 1893. 2. 10, M. 3. December 21, 1892. 4. 9 years. 5. Abscesses. 6. Bilateral bony. 7. $\frac{1}{4}$ inch. 8. Condyles removed. 9. (?). 10. Excision of part of ramus. 11. (?). 12. None. 13. $\frac{3}{4}$ inch opening.

Case 76.—1. Capony, Thèse de Lyon, 1892. 2. 25, M. 3. (?). 4. 10 years. 5. Injury. 6. Bilateral bony. 7. (?). 8. (?). 9. Retreating chin. 10. Resection of both joints. 11. (?). 12. Permanent right facial paresis. 13. Normal.

Case 77.—1. S. G. Campbell, Glasgow Med. Jour., 1889. 2. 28. 3. (?). 4. 22 years. 5. Fracture. 6. Right bony. 7. None on right. 8. (?). 9. Imperfect development. 10. Bone resection. 11. (?). 12. None. 13. (?).

Case 78.—1. R. Borella, Jahresbericht der Med., 1892. 2. 24, F. 3. (?). 4. 19 years. 5. Injury. 6. Bilateral bony. 7. (?). 8. (?). 9. Typical. 10. Resection of both condyles. 11. (?). 12. None. 13. Recurred in 10 months.

Case 79.—1. Bornet, Gaz. des Hôpitaux, 1863. 2. 14, F. 3. June 20, 1863. 4. (?). 5. Gangrenous stomatitis. 6. Right bony. 7. (?). 8. Dilatation and Rizzoli's operation. 9. (?). 10. Esmarch's operation. 11. (?). 12. None. 13. Opening 1 cm.

Case 80.—1. E. N. Nason, Lancet, 1895. 2. 39, M. 3. January 7, 1894. 4. 7 years. 5. Injury. 6. Right bony. 7. None. 8. (?). 9. (?). 10. Removed wedge of bone. 11. (?). 12. None. 13. Permanent.

Case 81.—1. Middledorpf and Fischer, Arch. f. klin. Chir., 1871. 2. 27, M. 3. July 2, 1868. 3. November 25, 1868. 4. (?). 5. Scarlet fever. 6. Bilateral bony. 7. Slight. 8. (?). 9. Retreating chin. 10. Excision of bone wedge by Esmarch's method. 11. (?). 12. None. 13. 3.2 cm. open.

CASE 82.—1. J. Wolf, Verhandl. der verl. med. Gesell., 1897. 2. 17, M. 3. March 6, 1897. 4. 16 years. 5. Forceps delivery. 6. Bilateral bony. 7. None. 8. (?). 9. Bird's beak. 10. Coronoid process separated from temporal insertion. Small piece removed. 11. (?). 12. None. 13. Open 3 cm.

CASE 83.—1. Whitehead, British Med. Jour., 1874. 2. 10, F. 3. (?). 4. 6 years. 5. Scarlet fever. 6. Bilateral bony. 7. None. 8. Force with anesthetic. 9. (?). 10. Forcible fracture of condyle. 11. (?). 12. None. 13. Almost normal.

CASE 84.—1. Paul Ischmarke, Med. gesellschaft zu Magdeburg, 1898. 2. 11, F. 3. July 11, 1898. 4. 9 years. 5. Injury. 6. Unilateral bony. 7. None. 8. (?). 9. Bird's beak. 10. Removed condyloid process, head and neck. 11. (?). 12. None. 13. Good.

CASE 85.—1. Schulten, Arch. gén. de Chir., 1879. 2. 13, M. 3. 1877. 4. 10 years. 5. Otorrhea. 6. Bilateral bony. 7. (?). 8. Both coronoid processes cut through. 9. (?). 10. Section of coronoid process. 11. (?). 12. None. 13. Successful.

CASE 86.—1. Riegner, Deutsch. med. Woch., 1896. 2. (?). 3. (?). 4. (?). 5. (?). 6. Bilateral bony. 7. (?). 8. (?). 9. (?). 10. Helferich's operation. 11. (?). 12. None. 13. Excellent.

CASE 87.—1. Poulton, Australasian Med. Gaz., 1893. 2. 17. F. 3. 1892. 4. 11 years. 5. Injury. 6. Bilateral bony. 7. $\frac{1}{16}$ inch. 8. (?). 9. (?). 10. Removed neck and part of condyle. 11. (?). 12. Sinus on left. 13. Good movement.

CASE 88.—1. Poulton, Australasian Med. Gaz., 1893. 2. 24, F. 3. 1892. 4. (?). 5. Fever. 6. Right, bony. 7. (?). 8. (?). 9. (?). 10. Removed neck of condyle and base of zygoma. 11. (?). 12. None. 13. Free movement.

CASE 89.—1. Rhinault, Lancet, 1883. 2. $3\frac{3}{4}$, M. 3. April 30, 1882. 4. 2 years. 5. Injury. 6. Left, bony. 7. (?). 8. (?). 9. (?). 10. Removed fragments from zygoma. 11. (?). 12. None. 13. Open 1 inch.

CASE 90.—1. Reid, Arch. gén. de Méd., 1879. 2. (?). 3. August 22, 1857. 4. (?). 5. (?). 6. Cicatricial. 7. (?). 8. (?). 9. (?). 10. Resected piece of mandible. 11. (?). 12. None. 13. Good.

CASE 91.—1. Roosing, Centralbl. f. Chir., 1893. 2. 31, F. 3. October 19, 1889. 4. 1 year. 5. Pyemia. 6. Bilateral bony. 7. (?). 8. (?). 9. (?). 10. Bottini—Konig's method. 11. (?). 12. None. 13. Normal.

CASE 92.—1. Roosing, Centralbl. f. Chir., 1893. 2. (?). 3. April 17, 1890. 4. 1 year. 5. Rheumatism. 6. Right, bony. 7. 1 mm. 8. (?). 9. (?). 10. Bottini—Konig's method. 11. (?). 12. None. 13. (?).

CASE 93.—1. Little, Trans. New York Med. Soc., 1873–74. 2. 19, F. 3. September 20, 1873. 4. 5 years. 5. Abscess. 6. Right, bony. 7. None. 8. (?). 9. (?). 10. Excision of condyle. 11. (?). 12. None. 13. Open $\frac{7}{8}$ inch.

Case 94.—1. Maas, Arch. f. klin. Chir., 1871–72. 2. 27, M. 3. July 2, 1868. 3. November 25, 1868. 4. 17 years. 5. Scarlet fever. 6. Bilateral bony. 7. None. 8. (?). 9. Retreating chin. 10. Esmarch's operation on right. 10. Esmarch's operation on left. 11. (?). 12. None. 13. Open 3.2 cm.

Case 95.—1. W. Grube, Arch. f. klin. Chir., 1863. 2. 21, F. 3. September 23, 1861. 3. October 25, 1861. 4. 15 years. 5. Swelling. 6. Left, bony. 7. None. 8. (?). 9. Retreating jaw. 10. Excision of joints and condyloid process removed through mouth. 10. Subcutaneous section of masseter. 11. (?). 12. None. 13. Muscle contracted. 13. Good movement.

Case 96.—1. R. Abbe, New York Med. Jour., 1881. 2. 10, M. 3. December 10, 1879. 4. 7 years. 5. Otitis media. 6. Left, bony. 7. Slight. 8. Dilatation. 9. Retreating chin. 10. Removed neck of mandible. 11. (?). 12. None. 13. Good.

Case 97.—1. Ranke, Arch. f. klin. Chir., 1885. 2. 10, M. 3. March 9, 1885. 4. 9 years. 5. Suppuration. 6. Left, bony. 7. (?). 8. (?). 9. (?). 10. Konig's resection. 11. (?). 12. None. 13. Open 3.5 cm.

Case 98.—1. H. Morestin, Bull. et mém. Soc. de Chir. de Paris, 1910. 2. 18, F. 3. January 2, 1909. 3. January 16, 1909. 4. 14 years. 5. Injury. 6. Bilateral bony. 7. None. 8. (?). 9. Chin retracted. 10. Bony mass removed on right. 10. Bony mass removed on left. 11. (?). 12. Occasional subluxation. 13. Open 3 cm.

Case 99.—1. M. Ceravasse, Bull. et mém. Soc. de Chir. de Paris, 1896. 2. 30, M. 3. December 26, 1893. 4. 6 years. 5. Gunshot. 6. Right, bony; left, fibrous. 7. None. 8. (?). 9. (?). 10. Resection of bone on right; adhesions broken on left. 11. (?). 12. Chloroform narcosis; laryngotomy. 13. Good.

Case 100.—1. Felix Legueu, Bull. et mém. Soc. de Chir. de Paris, 1903, 2. M. 3. October, 1901. 4. 13 years. 5. Injury. 6. Bony, 7. None. 8. (?). 9. Jaws in contact. 10. Removed part of condyle. 11. (?). 12. Paralysis of orbicularis palpebrarum; recovery. 13. Excellent.

Case 101.—1. Nicola Giannetasis, Gaz. de osp. Milano, 1907. 2. 20, M. 3. April 20, 1907. 4. 8 years. 5. Typhoid. 6. Right, bony. 7. None. 8. (?). 9. (?). 10. Removed callus. 11. (?). 12. Slight paresis. 13. Good.

Case 102.—1. Mario Donati, Arch. gén. de Chir. de Paris, 1912. 2. 9, M. 3. December 9, 1909. 3. December 13, 1909. 4. 7 years. 5. Suppurative otitis. 6. Bilateral, bony. 7. None. 8. (?). 9. Retreating chin. 10. Resection of right condyle. 10. Removed bony mass from left. 11. (?). 12. Tracheotomy. 13. Perfect 2 years later.

Case 103.—1. Alexander, Beit. f. klin. Chir. Tubing., 1898. 2. 15, F. 3. May 7, 1895. 4. 13 years. 5. Fever. 6. Bilateral, bony.

7. None. 8. (?). 9. (?). 10. Resection of both sides. 11. (?). 12. None. 13. Open 2 to 3 cm.

Case 104.—1. Alexander, Beit. f. klin. Chir. Tubing., 1898. 2. 17, F. 3. June 29, 1895. 4. 16 years. 5. Scarlet fever. 6. Right, bony. 7. None. 8. (?). 9. (?). 10. Bone removed; muscle interposed. 11. (?). 12. None. 13. Open 2 cm.

Case 105.—1. Alexander, Beit. f. klin. Chir. Tubing., 1898. 2. 12, M. 3. August 14, 1897. 4. 4 years. 5. Rheumatism. 6. Left, bony. 7. None. 8. (?). 9. (?). 10. Bone removed from joint, coronoid process removed; muscle interposed. 11. (?). 12. None. 13. Normal.

Case 106.—1. Giors, *Injuries and Diseases of the Jaw,* by Heath, Philadelphia. 2. 7, F. 3. 1874. 4. (?). 5. (?). 6. (?). 7. (?). 8. (?). 9. (?). 10. Resection of condyle. 11. (?). 12. None. 13. (?).

Case 107.—1. Wilrus, Berlin. 2. (?). 3. 1858. 4. (?). 5. (?). 6. Cicatricial. 7. (?). 8. (?). 9. (?). 10. Esmarch operation. 11. (?). 12. None. 13. Good.

Case 108.—1. Dittle, Vienna. 2. 20, M. 3. June 16, 1859. 4. 10 years. 5. Injury. 6. Right, bony. 7. (?). 8. Gymnastic. 9. Retreating chin. 10. Esmarch operation. 11. (?). 12. None. 13. Good.

Case 109.—1. Wagner, Konigsberg. 2. (?). 3. (?). 4. (?). 5. (?). 6. (?). 7. (?). 8. (?). 9. (?). 10. Esmarch operation. 11. (?). 12. None. 13. Good.

Case 110.—1. L. Bilczynski, Jahresbricht der Med., 1897. 2. 13, F. 3. (?). 4. 7 years. 5. Variola. 6. Left, bony. 7. None. 8. (?). 9. Retreating chin. 10. Resection of 2 cm. bone interposition of muscle. 11. (?). 12. None. 13. 3 cm. opening.

Case 111.—1. E. von Bergemann, Arch. f. klin. Chir., 1892–93. 2. 19, F. 3. October 10, 1891. 4. 19 years. 5. Forceps delivery. 6. Bilateral, bony. 7. None. 8. (?). 9. Retracted chin. 10. Resection of both processes. 11. (?). 12. None. 13. Open 3 cm.

Case 112.—1. Aubry, Schmidt's Jahrbucher, 1865. 2. 13, M. 3. June 8, 1863. 4. 3 years. 5. Gangrene of mouth. 6. Left, bony. 7. Slight. 8. (?). 9. (?). 10. Excision of horizontal ramus. 11. (?). 12. None. 13. Normal.

Case 113.—1. Aubry, Schmidt's Jahrbucher, 1865. 2. 26, F. 3. January 29, 1864. 4. (?). 5. Gangrene of mouth. 6. Left, bony. 7. (?). 8. (?). 9. (?). 10. Excision of horizontal ramus. 11. (?). 12. None. 13. Normal.

Case 114.—1. Valaguier, Bull. et mém. Soc. de Chir. de Paris, 1892. 2. 9, F. 3. September 15, 1892. 4. 5 years. 5. Injury. 6. Left, bony. 7. None. 8. (?). 9. Displaced forward. 10. Resection of ramus. 11. (?). 12. None. 13. Normal.

Case 115.—1. Hoffa, Centralbl. f. Chir., 1891. 2. 24, M. 3. (?). 4. (?). 5. Abscesses. 6. Bilateral, bony. 7. None. 8. (?). 9. (?). 10. Resection of coronoid processes. 11. (?). 12. (?). 13. Good.

Case 116.—1. Krummer, Bull. et mém. Soc. de Chir. de Paris, 1892. 2. 14, F. 3. March 17, 1891. 4. 3½ years. 5. Injury. 6. Bilateral, bony. 7. None. 8. (?). 9. (?). 10. Resection of both condyles. 11. (?). 12. None. 13. Good mastication.

Case 117.—1. Konig, Deutsch. Ztschr. f. Chir., 1878. 2. 11, F. 3. November 29, 1876. 4. 9 months. 5. Tooth infection. 6. Left, bony. 7. 0.5 cm. 8. (?). 9. (?). 10. Resection of joint. 11. (?). 12. Fistula. 13. Good.

Case 118.—1. Konig, Deutsch. Ztschr. f. Chir., 1878. 2. 27, F. 3. October 13, 1877. 4. 6 years. 5. Typhoid. 6. Right, bony. 7. 1 cm. on left. 8. (?). 9. (?). 10. Resection of joint. 11. (?). 12. None. 13. Normal.

Case 119.—1. Karenski, Berliner klin. Woch., 1899. 2. 24, F. 3. September 1, 1898. 4. 14 years. 5. Febrile disease. 6. Right, bony. 7. None. 8. Excision of scars; dilatation. 9. Bird's beak. 10. Removal of piece of bone. 11. (?). 12. None. 13. Expression good; open 3 cm.

Case 120.—1. P. Jernoli, Centralbl. f. Chir., 1891. 2. 17, F. 3. (?). 4. 16½ years. 5. Pertussis. 6. Bilateral, bony. 7. (?). 8. (?). 9. (?). 10. Bottini resected both coronoid processes. 11. (?). 12. None. 13. Marked improvement.

Case 121.—1. E. Küster, Langenbeck's Arch., 1888. 2. 18, F. 3. July 14, 1885. 4. 10 years. 5. Scarlet fever. 6. Left, bony. 7. Slight. 8. (?). 9. Bird's beak. 10. Resection of bone. 11. (?). 12. None. 13. Opening 3 cm.

Case 122.—1. E. Küster, Langenbeck's Arch., 1888. 2. 14, M. 3. April 18, 1887. 4. 2 years. 5. Boil. 6. Bilateral, bony. 7. None. 8. (?). 9. (?). 10. Resection of joint. 11. (?). 12. Tracheotomy. 13. Recurrence.

Case 123.—1. E. Küster, Langenbeck's Arch., 1888. 2. 9, M. 3. October 10, 1887. 4. 6 years. 5. Diphtheria. 6. Bilateral, bony. 7. Slight. 8. (?). 9. (?). 10. Resection of both joints and left coronoid process. 11. (?). 12. None. 13. Satisfactory.

Case 124.—1. E. Küster, Langenbeck's Arch., 1888. 2. 12, M. 3. March 27, 1888. 4. 6 years. 5. Diphtheria. 6. Bilateral, bony. 7. None. 8. Konig's operation. 9. (?). 10. Not described. 11. (?). 12. None. 13. Normal.

Case 125.—1. Kulenkampff, Centralbl. f. Chir., 1885. 2. 11, M. 3. (?). 4. 6 years. 5. Periostitis. 6. Left, bony. 7. 5 mm. 8. (?). 9. Displaced to left. 10. Excision of end of ramus. 11. (?). 12. Facial paresis. 13. Open 3.2 cm.

Case 126.—1. A. Lucke, Arch. f. klin. Chir., 1862. 2. 8, M. 3. (?). 4. (?). 5. None. 6. Left, bony. 7. (?). 8. Plastic operation. 9. (?). 10. Esmarch's operation. 11. (?). 12. Fistula. 13. 1½ years later open; normal.

Case 127.—1. A. Lucke, Arch. f. klin. Chir., 1862. 2. 4, M. 3. (?). 4. (?). 5. (?). 6. Left, bony. 7. (?). 8. (?). 9. (?).

10. Section of bone (Rizzoli's). 11. (?). 12. Fistula. 13. Opening 1 cm.

Case 128.—1. A. Lucke, Arch. f. klin. Chir., 1862. 2. 19, M. 3. June, 1861. 4. 6 years. 5. Typhoid (?). 6. Left, bony. 7. (?). 8. Plastic operations. 9. (?). 10. Section of bone at second molar. 11. (?). 12. None. 13. Died of pyemia.

Case 129.—1. Haus, Deutsch. Ztschr. f. Chir., 1900. 2. 17, F. 3. November 3, 1897. 4. 2 years. 5. Osteomyelitis. 6. Bilateral, bony. 7. None. 8. (?). 9. (?). 10. Bone chiselled out. 11. (?). 12. None. 13. Recurrence.

Case 130.—1. Haus, Deutsch. Ztschr. f. Chir., 1900. 2. 8, M. 3. June 10, 1899. 4. 3 years. 5. Scarlet fever. 6. Bilateral, bony. 7. (?). 8. Dilatation. 9. Displaced to right. 10. Removal of piece of bone. 11. (?). 12. None. 13. (?).

Case 131.—1. Wagner, Schmidt's Jahrbucher, 1861. 2. (?). 3. 1859. 4. (?). 5. Gangrene. 6. Unilateral, bony. 7. (?). 8. (?). 9. (?). 10. Excision of bone; wedge. 11. (?). 12. None. 13. Good.

Case 132.—1. Lentz, Congres Fran. de Chir. Procesberbaux, 1895. 2. 14, M. 3. December 18, 1894. 4. 8 years. 5. Scarlatina. 6. Unilateral, bony. 7. None. 8. (?). 9. (?). 10. Resection of condyle; interposition of muscle. 11. (?). 12. Paresis of upper eye-lid. 13. Open 3.5 cm.

Case 133.—1. Langenbeck, Langenbeck's Arch. 2. 17, M. 3. June 16, 1860. 4. 17 years. 5. Congenital. 6. Bilateral, bony. 7. None. 8. Section of masseters. 9. Retracted chin. 10. Resection of both coronoids. 11. (?). 12. None. 13. Good.

Case 134.—1. Lange, Jahresbericht der Med., 1886. 2. 8, F. 3. (?). 4. 3 years. 5. (?). 6. Left, bony. 7. Slight. 8. (?). 9. (?). 10. Resection of left joint (Konig). 11. (?). 12. None. 13. Good function.

Case 135.—1. J. E. Mears, Trans. Amer. Surg. Assoc., 1881. 2. 20, F. 3. January 26, 1883. 4. 18 years. 5. Gunshot wound. 6. Left, bony. 7. (?). 8. (?). 9. (?). 10. Excision of condyle; resection of masseter muscle. 11. (?). 12. None. 13. Good.

Case 136.—1. H. McGuire, Trans. Amer. Surg. Assoc., 1881. 2. Child. 3. (?). 4. (?). 5. Callus. 6. (?). 7. (?). 8. (?). 9. (?). 10. Wedge of bone removed at joint. 11. (?). 12. None. 13. Recurrence.

Case 137.—1. H. McGuire, Trans, Amer. Surg. Assoc., 1881. 2. F. 3. 1875. 4. (?). 5. (?). 6. Cicatricial bands. 7. (?). 8. (?). 9. (?). 10. Cut through bands and removed osseous plates. 11. (?). 12. None. 13. Good.

Case 138.—1. W. Knight. 2. 18, F. 3. October, 1892. 4. 13 years. 5. Injury. 6. Bilateral, bony. 7. None. 8. Dilatation. 9. Receding chin. 10. Removal of wedge-shaped bone. 11. (?). 12. None. 13. Can chew solids.

Case 139.—1. A. J. McCosh, Annals of Surgery, 1893. 2. 26, F. 3. January, 1893. 4. 3½ years. 5. Sepsis. (?). 6. Bilateral, bony. 7. None. 8. (?). 9. (?). 10. Bone resection. 11. (?). 12. None. 13. Can open mouth wide.

Case 140.—1. McBierney, Annals of Surgery, 1893. 2. (?). 3. (?). 4. 12 to 14 years. 5. Tubercular (?). 6. Bilateral, bony. 7. None. 8. (?). 9. (?). 10. Removed coronoid processes with head and neck of lower jaw. 11. (?). 12. None. 13. Open 1.5 cm.

Case 141.—1. J. R. Lunn, Clin. Soc. Trans., London, 1896. 2. 45, M. 3. August 18, 1894. 4. 23 years. 5. Rheumatism. 6. Bilateral, bony. 7. None. 8. (?). 9. (?). 10. Division of necks of condyles; piece of bone removed. 11. (?). 12. None. 13. Successful.

Case 142.—1. L. Poisson, Reviue de Chir., 1891. 2. 23, F. 3. April 2, 1891. 4. 20 years. 5. (?). 6. Bilateral, bony. 7. None. 8. (?). 9. Retreating chin. 10. Section angles of jaw; wedge removed from right. 11. (?). 12. None. 13. Opening 2 cm.

Case 143.—1. L. Ocher, Traite des Resections, Paris, 1891. 2. 16, F. 3. October, 1890. 4. 8 years. 5. Scarlet fever. 6. Left. 7. 3 mm. 8. (?). 9. (?). 10. Resection of condyle and neck. 11. (?). 12. Temporary facial paresis. 13. Open 3 cm.

Case 144.—1. Rizzoli, Bologna. 2. 15, M. 3. 1857. 4. 5 years. 5. Tuberculosis. 6. Right, bony. 7. None. 8. (?). 9. (?). 10. Bone section from within the mouth (4 cases similarly treated). 11. (?). 12. None. 13. Good.

Case 145.—1. W. T. Bull, New York Med. News, 1885. 2. 14, M. 3. (?). 4. 4 years. 5. Otitis media. 6. Right, fibrous. 7. (?). 8. Rupture of adhesions. 9. (?). 10. Excision of condyle. 11. (?). 12. None. 13. Free opening.

Case 146.—1. Weir, New York Med. News, December 20, 1884. 2. 32, F. 3. May, 1879. 3. 1883. 4. (?). 5. Injury. 6. Cicatricial. 7. (?). 8. (?). 9. (?). 10. Scars excised. 10. Excision of body of ramus. 11. (?). 12. Much pain. 13. Normal.

Case 147.—1. Weir, New York Med. News, December 20, 1884. 2. 16, M. 3. 1882. 4. 9 years. 5. Injury. 6. Bony (?). 7. None. 8. Stretching. 9. (?). 10. Piece of bone removed. 11. (?). 12. None. 13. Good motion.

Case 148.—1. Esmarch, Arch. gén. de Med., 1860. 2. 16, M. 3. May 4, 1858. 4. 1 year. 5. Typhoid fever and gangrene. 6. Left, bony. 7. Slight. 8. (?). 9. (?). 10. Resection of bone at fourth molar; plastic lip operation. 11. (?). 12. None. 13. Good function.

Case 149.—1. Wilms—reported by Esmarch. 2. 8, F. 3. March 30, 1858. 4. 3 years. 5. Ulcer of mouth. 6. Right, cicatricial. 7. (?). 8. Passive motion; wedge and incision of scars. 9. (?). 10. Esmarch operation. 11. (?). 12. None. 13. Open 2 cm.

Case 150.—1. Ranke, Arch. f. klin. Chir., 1885. 2. 25, M. 3. (?). 4. 13 years. 5. Fracture. 6. Right, bony. 7. 1 mm. 8. (?). 9. (?). 10. Konig's resection. 11. (?). 12. None. 13. Permanent.

Case 151.—1. Ranke, Arch. f. klin. Chir., 1885. 2. 16, F. 3. (?). 4. Early youth. 5. Osteomyelitis. 6. (?). 7. (?). 8. (?). 9. Retreating chin. 10. Konig's operation. 11. (?). 12. None. 13. Improvement.

Case 152.—1. Ranke, Arch. f. klin. Chir., 1885. 2. 17, M. 3. (?). 4. 10 years. 5. Injury. 6. Bilateral, bony. 7. None. 8. (?). 9. (?). 10. Bilateral resection by Bottini. 11. (?). 12. None. 13. Excellent.

Case 153.—1. Nagel, Diss. Gottengen., 1878. 2. 17, F. 3. (?). 4. (?). 5. Noma. 6. Cicatricial. 7. (?). 8. Removal of scar. 9. (?). 10. Bone section; mucous membrane interposed. 11. (?). 12. None. 13. Normal.

Case 154.—1. Baum, Case 154.—1. Baum—cited by Bruncke Diss. Gottengen., 1878. 2. 18, M. 3. (?). 4. 13 years. 5. Fracture. 6. Bony. 7. Slight. 8. (?). 9. (?). 10. Esmarch's operation. 11. (?). 12. None. 13. Good.

Case 155.—1. Buck—cited by Bruncke, Diss. Gottengen, 1878. 2. (?). 3. (?). 4. (?). 5. Noma. 6. (?). 7. (?). 8. Plastic operations. 9. (?). 10. Esmarch's operation. 11. (?). 12. None. 13. Satisfactory.

Case 156.—1. Demarquay—cited by Bruncke, Diss. Gottengen, 1878. 2. 16, F. 3. 1869. 4. 14½ years. 5. Typhoid. 6. Cicatricial. 7. (?). 8. Rizzolis' operation. 9. (?). 10. Esmarch's operation. 11. (?). 12. None. 13. Death.

Case 157.—1. Durham—cited by Bruncke, Diss. Gottengen, 1878. 2. 37, M. 3. 1871. 4. (?). 5. Gangrene. 6. (?). 7. (?). 8. Operation. 9. (?). 10. Esmarch's operation. 11. (?). 12. None. 13. Satisfactory.

Case 158.—1. Esterle—cited by Bruncke, Diss. Gottengen, 1878. 2. 24, F. 3. (?). 4. (?). 5. Gangrene. 6. (?). 7. (?). 8. (?). 9. (?). 10. Section of bone in front of ankylosis. 11. (?). 12. None. 13. Normal.

Case 159.—1. Herrgott—cited by Bruncke, Diss. Gottengen, 1878. 2. (?). 3. (?). 4. (?). 5. Necrosis. 6. (?). 7. (?). 8. (?). 9. (?). 10. Bone section. 11. (?). 12. None. 13. Good.

Case 160.—1. Bruns—cited by Verneuil, Arch. gén. de Med., 1860. 2. 5½, M. 3. March, 1855. 4. 2 years. 5. Gangrene. 6. Left, cicatricial. 7. None. 8. Dilatation. 9. (?). 10. Wedge of bone removed. 11. (?). 12. None. 13. Recurrence.

Case 161.—1. Carnochan—cited by Verneuil, Arch. gén. de Med., 1860. 2. 13, F. 3. 1840. 4. (?). 5. (?). 6. (?). 7. (?). 8. (?). 9. (?). 10. Attempt made to force opening; jaw fracture. 11. (?). 12. None. 13. Recurrence.

Case 162.—1. Marjolin, Gaz. Hebd. de Méd. de Chir., 1863. 2. 7, F. 3. 1862. 4. (?). 5. Gangrene. 6. Left, cicatricial. 7. Slight. 8. Dilatation. 9. (?). 10. Section of bone at cicatrix. 11. (?). 12. Gangrene. 13. Partial recurrence.

Case 163.—1. Huguier, Gaz. Hebd. de Méd. de Chir., 1863. 2. Child. 3. May, 1860. 4. (?). 5. (?). 6. Unilateral cicatricial. 7. (?). 8. (?). 9. (?). 10. Simple section. 11. (?). 12. None. 13. Recurrence.

Case 164.—1. Bauchet, Gaz. Hebd. de Méd. de Chir., 1863. 2. (?). 3. September, 1862. 4. (?). 5. (?). 6. Left, cicatricial. 7. (?). 8. (?). 9. (?). 10. Resection of bone in front. 11. (?). 12. None. 13. Good at first; recurrence.

Case 165.—1. Deguise, Gaz. Hebd. de Méd. de Chir., 1863. 2. 7, F. 3. April, 1862. 4. (?). 5. Typhoid. 6. Unilateral. 7. (?). 8. (?). 9. (?). 10. Removal of 1.5 cm. of bone. 11. (?). 12. None. 13. Recurrence.

Case 166.—1. Rossander, Arch. gén. de Med., 1879. 2. 7, F. 3. January, 1877. 4. 2 years. 5. Scarlatina. 6. Left, bony. 7. None. 8. (?). 9. (?). 10. Section of neck of condyle. 11. (?). 12. None. 13. Permanent.

Case 167.—1. Orlow, Deutsch. Ztschr. f. Chir., Leipzig, 1902–03. 2. 21, M. 3. December, 1899. 4. 14 years (?). 5. Scarlet fever (?). 6. Left, bony. 7. 1 to 2 mm. 8. (?). 9. Receding chin. 10. Removed one-quarter of ascending ramus. 11. (?). 12. None. 13. 0.75 cm.

Case 168.—1. Orlow, Deutsch. Ztschr. f. Chir., Leipzig, 1902–03. 2. 28, M. 3. February 4, 1900. 4. 24 years (?). 5. Abscesses. 6. Right, bony. 7. 1 mm. 8. (?). 9. Displaced to right. 10. Bone section. 11. (?). 12. Facial paresis. 13. Fair.

Case 169.—1. Orlow, Deutsch. Ztschr. f. Chir., Leipzig, 1902–0.3 2. 19, M. 3. November 27, 1900. 4. 8 years. 5. Gangrene. 6. Left, Bony. 7. 1 cm. 8. (?). 9. Displaced to left. 10. Removed 1.5 cm. of bone; inserted aluminum plate. 11. (?). 12. Facial paresis; recovery. 13. Opening 2.5 cm.

Case 170.—1. Orlow, Deutsch. Ztschr. f. Chir., Leipzig, 1902–03. 2. 23, M. 3. December 5, 1900. 4. 20 years. 5. Injury. 6. Bilateral, bony. 7. 2 to 3 cm. 8. (?). 9. Displaced to right. 10. Removed piece of bone. 11. (?). 12. Facial paresis. 13. Opening 3 cm.

Case 171.—1. Orlow, Deutsch. Ztschr. f. Chir., Leipzig, 1902–03. 2. 20, M. 3. October 19, 1901. 4. 13 years. 5. Variola. 6. Left, bony. 7. 0.75 cm. 8. (?). 9. Displaced to left. 10. Bone resected; gold plate implanted. 11. (?). 12. Facial paresis. 13. Fair.

Case 172.—1. Orlow, Deutsch. Ztschr. f. Chir., Leipzig, 1902–03. 2. 5, M. 3. November 12, 1901. 4. 2 years. 5. Injury. 6. Left, bony. 7. 1 mm. 8. (?). 9. Retracted to left. 10. Bone resected; metal plate implanted. 11. (?). 12. None. 13. (?).

Case 173.—1. Saritscheu—cited by Orlow. 2. (?), F. 3. 1894. 4. (?). 5. (?). 6. Bilateral, bony. 7. (?). 8. (?). 9. (?). 10. Bone resection. 11. (?). 12. None. 13. Good function.

Case 174.—Rechnitz—cited by Orlow. 2. 24, M. 3. 1891. 4. (?). 5. (?). 6. Bilateral, fibrous. 7. (?). 8. (?). 9. (?). 10. Resected coronoid processes. 11. (?). 12. None. 13. (?).

Case 175.—1. Rose—cited by Orlow. 2. (?). 3. (?). 4. (?). 5. Congenital. 6. Bilateral, bony. 7. (?). 8. (?). 9. (?). 10. Resected condyloid processes. 11. (?). 12. None. 13. (?).

Case 176.—1. Sklifassewski—cited by Orlow. 2. 18, F. 3. 1881(?). 4. 13 years. 5. Scarlet fever. 6. Bilateral, bony. 7. (?). 8. (?). 9. (?). 10. Resection of maxilla. 11. (?). 12. None. 13. Good.

Case 177.—1. Kustetzow—cited by Orlow. 2. 10, F. 3. (?). 4. 3 years. 5. Scarlet fever. 6. Unilateral, bony. 7. (?). 8. (?). 9. Atrophy of jaw. 10. Resection of joint. 11. (?). 12. None. 13. Good.

Case 178.—1. Beresowski—cited by Orlow. 2. 14, F. 3. 1901. 4. (?). 5. Measles. 6. Bilateral, bony. 7. (?). 8. (?). 9. (?). 10. Bilateral resection of condyloids; implanted muscle. 11. (?). 12. Salivary fistula. 13. (?).

Case 179.—1. Baumgartner—cited by Orlow. 2. 5, M. 3. (?). 4. (?). 5. Congenital. 6. Bony. 7. (?). 8. (?). 9. (?). 10. Mass of bone removed. 11. (?). 12. Fistula. 13. Fibrous adhesions.

Case 180.—1. Penrose, Medical News, 1890, vol. lvii. 2. 28, M. 3. April, 1890. 4. 4 years. 5. Acute artic rheumatism. 6. Bilateral, osseous. 7. None. 8. Operation with recurrence. 9. (?). 10. Vertical incision in front of ear; horizontal along lower edge of zygoma; portions of neck $\frac{1}{3}$ inch thick excised. 11. (?). 12. Stiffness overcome by rubber wedge. 13. $\frac{3}{4}$ inch opening.

Case 181.—1. Warner, Charleston Med. Jour., 1858, vol. xiii. 2. 17, M. 3. February, 1855. 4. 4 years. 5. Mercurial ptyalism 6. Right, fibrous. 7. Slight lateral; none down. 8. (?). 9. (?). 10. Cutting of fibrous bands. 11. (?). 12. None. 13. Permanent cure.

Case 182.—1. Traval, Sicilia Medica, 1891, vol. iii. 2. 9, M. 3. September 5, 1890. 4. 7 years. 5. Measles followed by ulceration. 6. Osseous, complete in right; incomplete on left. 7. Slight on left. 8. Dilatation. 9. Chin poorly developed. 10. Chiselled through osseous cicatrix. 11. (?). 12. None. 13. Good; opening 2 cm.

Case 183.—1. Baiardi, Bull. d. Chir., Milan, 1891, vol. viii. 2. $2\frac{1}{2}$, F. 3. (?). 4. From birth. 5. Arrest of development of mandible. 6. Left, fibrous. 7. Slight opening; no lateral movement. 8. (?). 9. Slight atrophy of jaw. 10. Resection of condyle and coronoid process on left section of masseter. 11. (?). 12. None. 13. Satisfactory.

Case 184.—1. Levoy—Kieferklemme, uibrebehandling Diss. Berlin, 1885. 2. 18, F. Operation by Sonnenburg. 3. June 22, 1885. 4. 14 years. 5. Purulent inflammation of right jaw. 6. Right. 7. None. 8. (?). 9. Retreating chin drawn to right. 10. Resection of condyloid processes. 11. (?). 12. None. 13. Good; 3 cm.

Case 185.—1. Lando—operation by Riche, Traitement de l'ankyloseosseuse Thése de mont pellies, 1905. 2. 26, M. 3. March 2, 1905. 4. 14 years. 5. Osteomyelitis of left jaw. 6. Left, osseous. 7. 2 mm. on left; 5 mm. on right; no lateral. 8. (?). 9. Slight arrest of development. 10. Bony mass found; no trace of normal parts; Piece 5 to 6 mm. long removed. 11. (?). 12. Hemorrhage from internal maxillary. 13. Failure suggests congenital ankylosis.

Case 186.—1. Murphy, Surgical Clinics, June 13, No. 3, vol. ii. 2. 28, M. 3. (?). 4. 4 years. 5. Abscessed molar tooth. 6. Right, fibrous. 7. None. 8. Operation through mouth; failure. 9. (?). 10. Cicatrices divided; two flaps interposed; one from roof of mouth and other from hard palate. 11. (?). 12. None. 13. Permanent result not known.

Case 187.—1. Gindus, Med. de l'Suisse Romande, 1902, vol. xxii. 2. 16, F. 3. November 30, 1895. 4. 10 years. 5. Fall on chin. 6. Bilateral, osseous. 7. 3 mm. 8. (?). 9. Retreating chin; jaw undeveloped. 10. Resection of bony mass which concealed normal parts. 11. (?). 12. None. 13. Good at end of 5 years; chin had developed considerably.

Case 188.—1. Wernher, Ztschr. f. d. ges Medicin., 1850, vol. xliv. 2. 23, M. 3. (?). 4. 20 years. 5. Scarlet fever followed by mercurial ptyalism. 6. Bilateral, osseous. 7. None. 8. (?). 9. Chin undeveloped. 10. Bony cicatrices connected upper and lower jaws, beginning at front molar teeth; piece of bone removed from each of these. 11. (?). 12. None. 13. Opening of more than $\frac{1}{2}$ inch.

Case 189.—1. Jonesco, Bull. et mém. Soc. de Chir. de Bucarest., 1902–03, vol. vi. 2. 20, F. 3. October, 1902. 4. Since infancy. 5. Otitis media. 6. Right, osseous. 7. None. 8. (?). 9. Retreating chin. 10. Resection of ascending ramus. 11. (?). 12. Severe hemorrhage. 13. Good.

Case 190.—1. Baross, Ein Fall von Kieferklemme ungar med Press, 1897. 2. 22, F. 3. (?). 4. 10 years. 5. Fracture of jaw. 6. Left, osseous. 7. None. 8. (?). 9. (?). 10. Resection of piece of bone 5 cm. long from body of maxilla in front of cicatrix. 11. (?). 12. None. 13. 2 cm. opening.

Case 191.—1. Konig, Deutsch. med. Woch., 1904. 2. M. 3. 1903. 4. (?). 5. Osteomyelitis of jaw. 6. Right, osseous. 7. None, right; slight, left. 8. Operation at 7 years of age and again at 22 with recurrence. 9. (?). 10. Resection of triangular wedge from ramus. 11. (?). 12. None. 13. Good after several months.

Case 192.—1. Mozzoni—reported by Zpfelin, Thése de Paris, 1886. 2. 27, F. 3. 1878. 4. 8 months. 5. Luxation of jaw. 6. Irreducible luxation both sides. 7. 2 cm. 8. (?). 9. Lower jaw thrust forward; mouth open and immovable. 10. Resection of condyles but not removed because muscular action pulled them back in place. 11. (?). 12. None. 13. Excellent.

Case 193.—1. Von Moorsel, Niderl. Tijdschr. v. Geneesk., 1910, vol. xlvi. 2. 7 months, M. 3. 1910. 4. From birth. 5. Congenital. 6. Bilateral, osseous. 7. Slight. 8. (?). 9. Retreating chin. 10. Resection of wedge-shaped piece from ascending ramus. 11. (?). 12. Hemorrhage; temporary facial paralysis. 13. Good. Child died few weeks later from convulsions.

Case 194.—1. Fabrikant, Russ. med. Rundschau, 1908. 2. 18, M. 3. June 30, 1907. 4. 8 years. 5. Scarlet fever followed by mastoiditis. 6. Left, osseous. 7. 0.25 cm. between incisors. 8. (?). 9. Left side of chin much retreated; displaced backward. 10. Excision of 2 cm. bone from ascending ramus. 11. (?). 12. None. 13. Good 3 cm.; opening.

Case 195.—1. Armour, West London Med. Jour., 1905. 2. 26, F. 3. January, 1905. 4. From infancy. 5. (?). 6. Bilateral, osseous. 7. None. 8. (?). 9. Back of development of horizontal ramus. 10. Cut through zygoma just in front of and behind tuberosity and neck of jaw. 11. (?). 12. None. 13. Good.

Case 196.—1. Bogoyavlenski, Khiruvgia, Moscow, 1910. 2. 22, M. 3. February 24, 1909. 4. Since childhood. 5. Inflammation of jaw with discharge of sequestra. 6. Not given. 7. None. 8. None. 9. Bird's beak appearance. 10. Resection of piece of ascending ramus; 1 cm. long, first on one side and a little later on the other; interposition of flap of buccinator muscle. 11. (?). 12. None. 13. After operation on first side, opening of 2 cm.; after second operation, opening of 4 cm.; appearance much improved; chin less retreating.

Case 197.—1. Miratvorilz, Vrach. Gaz., St. Petersburg, 1910. 2. 5, M. 3. June 25, 1907. 4. 2 years. 5. Scarlet fever; bilateral otitis media. 6. Bilateral. 7. Forcible stretching. 8. None. 9. Lower jaw and chin poorly developed. 10. Section of ascending rami at junction of upper and middle third masseter muscle interposed. 11. (?). 12. None. 13. Opening of 3 cm.; horizontal and vertical movement; Bird's beak appearance less marked.

Case 198.—1. Dr. Francis Reder, St. Louis, unpublished. 2. 26, F. 3. (?). 4. 7 months. 5. Noma following typhoid fever. 6. Bilateral. 7. None. 8. Jaws locked. 9. (?). 10. Skin flap from neck introduced into the mouth and attached to buccal site. 11. (?). 12. None. 13. 2 years after operation able to open two-thirds its normal extent.

Case 199.—1. Dr. Francis Reder, St. Louis, unpublished. 2. 14, M. 3. (?). 4. (?). 5. Compound fracture of lower jaw followed by infection. 6. (?). 7. (?). 8. (?). 9. (?). 10. Similar operation. 11. (?). 12. None. 13. Excellent.

Case 200.—1. V. P. Blair, Jour. Amer. Med. Assoc., vol. liii. 2. 21, F. 3. 1905. 4. Over 10 years. 5. Crushing injury of face. 6. Obstruction to movement by abnormally large styloid process. 7. $\frac{1}{8}$ inch. 8. Forceful dilatation. 9. Lower jaw receding. 10. Rami

sawed through subcutaneously, body of jaw brought forward and wired in place for twelve weeks; this increased the distance between the angle of the jaw and the obstructing styloid. 11. Closed. 12. None. 13. $\frac{5}{8}$ inch opening.

Case 201.—1. V. P. Blair—unreported. 2. 35, F. 3. December, 1912. 4. 23 years. 5. Multiple osteomyelitis. 6. Osseous of left side. 7. None. 8. None. 9. Fair. 10. Blair operation on left side; right side dilated. 11. Closed. 12. None. 13. 1 inch October, 1913; good lateral movement.

Case 202.—1. V. P. Blair—unreported. 2. 10, F. 3. February, 1913. 4. 3 months. 5. Injury to jaw 2 years previously. 6. Fibro-osseous. 7. $\frac{1}{2}$ inch. 8. None. 9. Slight distortion. 10. Forceful dilatation under anesthetic. 11. Closed. 12. None. 13. $1\frac{1}{4}$ inch opening.

Case 203.—1. V. P. Blair—unreported. 2. 19, F. 3. (?). 4. 6 years. 5. Hypertrophic arthritis. 6. Fibro-osseous. 7. $\frac{1}{2}$ inch. 8. None. 9. —. 10. Not operated. 11. —. 12. —. 13. —.

Case 204.—1. V. P. Blair—unreported. 2. 66, M. 3. (?). 4. 1 year. 5. Occurred during injection for tic douloureux. 6. Possible dislocation of interarticular fibrocartilage. 7. $\frac{3}{4}$ inch. 8. None. 9. O. K. 10. Not operated. 11. —. 12. —. 13. $\frac{3}{4}$ inch opening.

Case 205.—1. V. P. Blair—unreported. 2. 34, F. 3. —. 4. (?). 5. Syphilitic necrosis of jaw. 6. Fibrous. 7. $\frac{5}{8}$ inch. 8. None. 9. Distorted. 10. Not operated. 11. —. 12. —. 13. —.

Case 206.—1. V. P. Blair—unreported. 2. 3, F. 3. —. 4. (?). 5. Multiple gonorrheal arthritis. 6. Fibrous. 7. $\frac{1}{2}$ inch. 8. None. 9. Retracted jaw. 10. Not operated. 11. —. 12. —. 13. —.

Case 207.—1. V. P. Blair—unpublished. 2. 57, M. 3. —. 4. 12 years. 5. Hypertrophic arthritis. 6. Fibrous. 7. $\frac{1}{2}$ inch. 8. None. 9. O. K. 10. Gradual dilatation with dilator. 11. —. 12. None. 13. Open $\frac{3}{4}$ inch.

Case 208.—1. V. P. Blair, *Surgery of Mouth and Jaw*, 1912. 2. 16, F. 3. 1911. 4. 13 years. 5. Gonorrhea injury (?). 6. Fibro-osseous right side. 7. $\frac{1}{8}$ inch. 8. Dilatation under chloroform at 3 years. 9. Receding lower jaw. 10. Excision of upper end of right ramus and transplantation of superficial temporal fascia; left ramus sawed transversely and body of mandible brought forward; rib cartilage transplanted into chin. 11. Closed. 12. None. 13. 1 year later increasing good profile and good lateral movement.

Case 209.—1. V. P. Blair, *Surgery of Mouth and Jaw*, 1912. 2. 5, F. 3. 1911. 4. Over 2 years. 5. Injury. 6. Fibro-osseous; both sides. 7. $\frac{1}{4}$ inch. 8. None. 9. Undeveloped, retracted lower jaw. 10. Blair operation on both sides. 11. Open. 12. None. 13. $\frac{1}{16}$ inch opening; chin retracted.

Case 210.—1. V. P. Blair—unpublished. 2. 16, M. 3. 1909. 4. 12 years. 5. Calomel (?); noma (?). 6. Scar bands in cheek.

7. None. 8. None. 9. Fair. 10. Scars excised; cheek repaired externally and lined with a skin flap from neck. 11. Closed. 12. None. 13. Case lost sight of; immediate result $\frac{5}{8}$ inch.

Case 211.—1. V. P. Blair, Bull. St. Louis Med. Soc., April, 1910. 2. 22, M. 3. 1910. 4. 11 years. 5. Trauma over joint. 6. Fibro-osseous left side. 7. $\frac{1}{4}$ inch. 8. None. 9. O. K. 10. Blair operation on left side. 11. Open with 1-inch block. 12. Permanent paralysis of anterior belly of accipitofrontalis of left side. 13. $1\frac{3}{8}$ inch opening 18 months later; good lateral movement.

Case 212.—1. V. P. Blair, Jour. Amer. Med. Assoc., vol. liii, and *Surgery of Mouth and Jaw*, 1912. 2. 23, F. 3. 1908. 3. 1911. 4. Over 17 years. 5. Scarlet fever and periarticular suppuration at 2 years. 6. Bony on right side. 7. None. 8. Uneffective dilatation. 9. Lower jaw receding. 10. In 1908 sawed ramus subcutaneously on both sides, drew chin forward, wired jaws close and transplanted costal cartilage to chin; jaw retained new position but opening gradually decreased to $\frac{1}{4}$ inch. 10. Blair operation on right side. 11. (?). 12. Temporary paralysis of right orbicularis palpebrarum; permanent paralysis of right anterior belly of occipitofrontalis. 13. $\frac{5}{8}$ inch opening.

THE TERMINAL RESULTS OF BILIARY OBSTRUCTION

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Many minor factors in the pathology of the biliary passages remain for accurate solution. Although the general structure and disposition are simple and of easy comprehension, the kaleidoscopic changes which may ensue present a picture, oftentimes extremely difficult to understand, confusing alike to the anatomist and to the surgeon.

Perhaps in no other part of the body is it so important that the surgeon first become a master of the normal and the pathological conditions. If ever there is a plea for specializing in our art, it has its emphasis in abdominal surgery. Most truly has it been said that at the present "we have too many surgeons unless they are better ones." I am sure this society without dissent would approve this opinion as specially true of abdominal surgery.

In all comprehensive treatises upon medicine, covering many centuries, will be found graphic descriptions of the serious suffering, with its frequent fatal termination, incident to biliary obstructions. Such records have a present and important value, because they show the terminal results following interruption or obstruction of the biliary secretion; indeed, clinical histories of today often duplicate the past.

Until peritonitis was demonstrated to be a result of infection introduced within the abdominal cavity, it is not

to be wondered at that the death which ordinarily ensued was in itself reason sufficient for ruling the abdomen and its contents beyond the pale of surgery. Thoughtful, brave, conscientious surgeons were not wanting in a wise determination to try to afford relief, if not cure, of some of the more evident pathological conditions.

Perhaps the simplest of all these to solve was the removal of cystic tumors of the ovary. Here was an objective condition, easily understood, that rapidly went on from month to month, clearly traceable by the clinical observer to an almost certain fatal conclusion. Yet the history of surgical intervention is an heroic fight of the few against the conservatism of the many. When at last an operation was determined upon the pathologic complications and the exhausted condition of the patient too often weighed in the balance against recovery, and the result was charged against the bold innovator.

This history was equally true at the beginning of surgical intervention for the relief of biliary obstruction. It is almost pathetic to note the strenuous efforts that had been made in an earlier period to shut off the peritoneal cavity in the region of the gall-bladder for the distinct purpose of securing an opening for the relief of biliary obstruction. When the gall-bladder was sufficiently dilated to present a distinct circumscribed tumor the cautery was repeatedly applied to induce so-called inflammatory adhesions. This end attained, an opening was made, either by cautery or by knife.

Even more ingenious, and probably attended by less suffering, was the insertion of a certain number of fine needles into the gall-bladder. These were permitted to remain for a considerable period, followed by reapplication, until it was judged safe to believe that adhesions had occurred and an opening could be made without involving the peritoneal cavity. Occasionally needles were lost, having found their way into the gall-bladder. Another clever contrivance

was the insertion of the needles through a piece of leather, thereby securing their retention.

Before discussing the terminal results of operative procedures for biliary obstruction, let us review in brief the possible abnormalities and pathologic conditions which may ensue for the prevention and relief of which operative measures are advised. One result of the interference with the normal outflow of the biliary secretion, from whatever cause, is sure to be a more or less equal dilatation of the biliary passages, from the site of the obstruction to the capillary bile-ducts which permeate the liver. The pressure at first is naturally greatest near the site of obstruction, and in the earlier part of the pathologic process is usually limited to the gall-bladder and ducts; hence the enormously dilated gall-bladder and not seldom the enlarged common, cystic, and hepatic ducts.

Although biliary calculi forming in the gall-bladder are by far the more common causes of obstruction, there are many other conditions which may impede or cut off the outflow of bile into the intestine. Retention of inspissated bile in the gall-bladder, without calculi, enlarged lymphatic glands, and new growths of malignant character, as well as disease at the head of the pancreas, are sometimes found. The cystic duct is not seldom the site of obstruction which may be due to unusual flexures, folds of the mucous membrane, cicatrices, as secondary conditions. The duct may be completely obliterated by these means, enormous dilatations of the gall-bladder may occur, producing most remarkable changes in the organ itself as well as in its contents. Bile may be almost wholly wanting and is replaced by a serous, albuminous fluid, often resembling the synovia of the articulations. Cases are on record where the ducts themselves have been dilated to the size of the intestines.

The dilatation of the biliary ducts in the interior of the liver is more commonly uniform. In well-marked cases the entire capillary network of the biliary passages is distended

with bile. The parenchyma of the liver is saturated with bile, and the entire organ becomes turgid and friable, resembling the condition of yellow atrophy. Occasionally the biliary ducts within the liver dilate in the form of cysts, containing mucus and bile. If the obstruction is acute and complete, this pressure is generally exercised upon the ramifying biliary passages and not seldom produces destructive changes in this important organ. When the obstruction is less marked, an effort of natural conservation takes place, and the gall-bladder is the first to yield to the reflex pressure.

If the generally accepted belief is true that bacteria from the intestinal canal find their way into the gall-bladder, even when the biliary current is more or less constant, we may seek an anatomical cause in the failure of the valve-like opening into the intestine which ordinarily prevents regurgitation. As a double protection, the oblique entrance of the cystic into the common duct still further prevents the gall-bladder from being the seat of intestinal infections. Nature uses this anatomic disposition in the most important way in the entrance of the ureter into the bladder, and in the passage of the spermatic cord through the abdominal wall. In like manner the pressure of the duodenal contents normally closes the inlet of the biliary and pancreatic ducts.

In the fault of anatomic defect, permitting the reflow of fluid carrying infection, we may accept as possible, even probable, the transmission of bacteria through the lymphatic vessels into the gall-bladder.

Reports of large cystic tumors of the gall-bladder are not so very rare; they have been mistaken for certain other pathologic conditions. The first operative case reported in America is that of the late Dr. John S. Bobbs, of Indiana, who, in 1848, operated, having mistaken the dilated gall-bladder for a cystic tumor of the ovary. It is a credit to the memory of Dr. Bobbs, and also to the history of American surgery, that he was quite equal to the occasion, and profited by his anatomic knowledge. He was teacher of surgery

at Indianapolis, and much beloved by his pupils. He was a surgeon in the Civil War. At the time of his operation on the gall-bladder he must have been familiar with what little was known of abdominal surgery. He was made aware, by the escape of a gall-stone, that the large cyst he had opened was the gall-bladder. He removed the calculus; carefully sutured the wound in the distended gall-bladder, returning this to the abdominal cavity without drainage. The patient made an easy recovery and lived for many years.

Soon after my return from the Civil War, Dr. E. Palmer, of Cambridge, an elderly man of great acumen and repute, came under my supervision. He had long had repeated attacks of biliary obstruction, was certain that he had a greatly enlarged gall-bladder, with at least one very large gall-stone. He insisted that I should know enough to operate upon him; that sufferers like him were entitled to surgical relief. He outlined what he considered the necessary factors of the operation, and made me promise that, for my benefit, I would operate on him after death. This I did, and have now in my possession the gall-stone, quite as large as a hen's egg.

My old master, J. Marion Sims, published the history of a patient operated upon in 1878, in Paris, followed by recovery. He had studied the subject with great care and outlined the operative procedure much as practised at present.

In 1881 I had a long discussion with my friend, Lawson Tait, in England. His first publication was in 1882;[1] his last, in 1889, included a series of twenty cases. He gave me the results of seventeen operations. He urgently advised that surgical relief was to be given in every favorable case.

The following is a marked illustration of the conservatism of thirty years ago. The consultations are worthy of report,

[1] British Medical Journal.

since they offer a fair exponent of professional opinion of that time:

Mrs. H., aged fifty years, of wealth and good social standing, with a previous record of excellent health, had returned from her summer vacation to the city in September, 1882. She was suddenly seized with acute biliary obstruction and jaundice. Diagnosis: gall-stones. I advised operation. Her family physician, Dr. Z. B. Adams, in consultation, emphatically advised against operation, saying he knew the family history well, and that it was probably cancer. My old master, Henry I. Bowditch, also saw her. He clearly recognized the immediate danger—that the probable cause was a gall-stone impacted in the common duct. In his emphatic way he said: "In the name of heaven, Dr. Marcy, if you know enough, operate! She can't live." The friends summoned Dr. Calvin Ellis, professor of pathological anatomy in Harvard. He recognized the general condition, but said we had no right to operate under any circumstances, remarking that the cause of the obstruction, although acute, was by no means certain, and adding in a semiplayful way, "It may be a worm!"

It seemed to me, however, that even a worm might not be difficult to remove. I shall never forget the consultation with the friends and the query: "But, Dr. Marcy, did you ever operate for the relief of biliary obstruction?" "No." "Is there any surgeon in Boston who ever operated? Is there any surgeon in America who ever operated?" "So far as I am aware, no." It was natural that they should conclude, as they did, that they would rather trust to Nature and to God than to an inexperienced surgeon.

A few more days of agonizing suffering and I made the operation after death; there was a single, close-fitting stone completely occluding the common duct. The ramifying ducts of the liver were much distended, and the liver itself gave the general picture of acute yellow and brown atrophy.

By an odd coincidence, only a few days later, a lady who had long been under my care was seized with a similar violent attack of biliary colic, with fatal result and autopsy. Again, after consultation, operation had been refused. I then determined that my advice should be accepted in future experiences, or I would cease attendance and responsibility.

My first operative case was upon a distinguished member of our profession who had diagnosed his own condition and sought relief. I operated in July, 1887, for an impacted stone. I believe this was the first operation, deliberately determined upon, in the United States.[1]

In October, 1889, I removed a calculus impacted in the common duct, weighing when dry 59 grs. It was rough and hard, resisting every effort for removal or crushing. With much difficulty I exposed the parts and divided the full length of the cystic duct, which was greatly dilated, and the common duct to the stone in its lower third. I carefully sutured the entire wound of both the ducts and the gall-bladder, in double layer, closing the abdominal wall without drainage. My delight and relief may be appreciated when, in the vomitus following ether, an abundant mixture of bile appeared.

I have seen the patient from time to time until the present. She has had occasional mild attacks of jaundice, owing probably to cicatricial contractions. Priority for the removal of the calculus from the common duct is given me, based on this operation.[2]

Until biliary obstruction was accepted as coming within the domain of surgery, the physician trusted entirely to Nature's effort for the expulsion of the obstruction. Many believed these efforts were aided by the administration of

[1] Surgical Relief for Biliary Obstruction, Jour. Amer. Med. Assoc., December 20, 1890, by Henry O. Marcy.

[2] Operations for the Relief of Biliary Obstruction, Jour. Amer. Med. Assoc., December, 1890.

medicinal remedies. Patients suffering from biliary colic were watched with care, and the stools were examined for gall-stones.

Many cases have been reported where large gall-stones have escaped into the intestinal canal and then become a source of serious danger. The contribution by our colleague, Dr. Frank Martin, of Baltimore, at the last meeting of this Association, upon intestinal obstruction due to gall-stones, is of great value.

In 1881 two large calculi were sent to me by Dr. Charles H. Cook, of Natick. They had been removed by dilatation of the sphincter ani muscle, because of local obstruction. The woman was very ill—for a long time she was supposed to be dying of cancer of the liver, with no suspicion of biliary obstruction. Relief suddenly supervened, with rapid convalescence, and six weeks later these stones were removed.

It is the general consensus of the medical profession that the terminal results of biliary obstruction are for the most part fatal, except when Nature relieves it by expulsion into the intestinal canal.

In the moderately rare condition, where the obstruction is due to inspissated bile, operation is advised, although there may be a fair chance of recovery without it. In my entire series of cases I have operated but twice where I found this condition and felt warranted in opening and draining the gall-bladder.

Spontaneous rupture of the gall-bladder produced by overdistention, more commonly with gall-stones, is not infrequent. Many cases have been reported. In certain conditions this may be regarded as a constantly present danger. The following is illustrative—briefly reported:

Mr. C., a man, aged fifty years, had suffered several attacks of acute biliary colic, and I had frequently advised operation; gall-bladder was distended; conditions marked and easy of definite diagnosis. He was a man busy with important affairs, but he promised to accept my advice

at an early date. A little later I heard of his death and called. I was met with the query, "But why did you not respond to our repeated urgent summons?" A forgetful servant had neglected to report the demand. A physician had been called, in emergency, and he had already rendered the certificate—cause of death, "heart failure."

An autopsy was permitted: I found a largely distended, ruptured gall-bladder, with multiple calculi, the cause of an acute peritonitis.

Carcinoma of the biliary passages is usually an extension of the disease from the liver or neighboring organs. Primary cancer of the bile-ducts is very rare. The following is the only illustrative case I have met in my surgical experience:

Mr. M., aged thirty years, entered hospital May 6, 1898. Somewhat ill for months, with loss of flesh and strength; local pain; occasional vomiting; marked jaundice; plainly biliary obstruction, with distended gall-bladder. Operation May 6, assisted by Dr. W. H. Clancy, of Cambridge, his family physician. No calculi found; ducts greatly dilated; liver enlarged and darkly mottled; could not insert probe through the intestinal opening, nor could water be injected into the duodenum. The flow of bile from the wound was enormous for some days; it soon appeared of a healthy character; the deep jaundice cleared up; nausea ceased; patient was discharged May 20, greatly improved, with a free outflow of bile through the external fistula.

Rapid relapse; readmitted to hospital June 23; duct patent quite to intestine; obstruction evidently in the intestinal wall. United the gall-bladder to the duodenum by means of a small Murphy button. Although the structures received very little injury from operative interference, there ensued a general capillary oozing, controlled with difficulty. Hospital report note: "Do not remember ever having seen so troublesome a wound from venous oozing; bleeding everywhere."

The operation was not specially difficult. The wound

was packed with iodoform gauze, but, despite every effort death occurred in twelve hours. Autopsy: no calculi were present. The liver, soft and friable, was somewhat enlarged; cause of obstruction was a primary carcinoma in the wall of the intestine surrounding the efferent duct, not larger than a small, flattened pea, which completely closed the canal.

The uniting of the gall-bladder to the duodenum may be an operation of the first importance, whenever the integrity of the common duct is involved. Usually it is not attended with any special difficulty. The following from the hospital records is an illustrative case. The history and previous operative findings were most confusing:

Mrs. K., patient of Dr. O. E. Johnson, of Winthrop, entered my hospital November 29, 1903; had suffered from biliary obstruction for previous five years; last attack in September; since that date her weight, which was then one hundred and thirty-five pounds, has fallen to one hundred; is markedly jaundiced and a great sufferer. Diagnosis: biliary obstruction from gall-stones. No gall-stone found at operation; gall-bladder drained; convalescence rapid and uneventful; discharged December 23; biliary flow through fistula free, jaundice nearly disappeared, no bile in urine; stools very light-colored; general improvement marked.

Readmitted to hospital September 6, 1904. Dr. Johnson assisted in operation; healthy bile flowed freely from a sinus into which a director easily entered upward and backward. The most careful examination failed to detect a stone, which seemed the probable cause of obstruction. Since her operation of the previous December the patient has been entirely free from suffering; has gained in flesh and strength; has no jaundice; her stools are dark colored, and it seems reasonable to believe that a portion of the bile finds its way into the intestine. Forcible distention through the gall-bladder by a syringe showed no evidence of the water entering the intestine.

Opened the abdomen in the line of the old incision, and united the gall-bladder to the duodenum by the use of Dr. Harrington's four-section button; removed the iodoform drain the second day; wound healed without infection, with surprisingly little pain or tenderness; the sections of the button were passed with the stool, without the knowledge of the patient, upon the thirtieth day after the operation. Mrs. K. died some time in the year following from a disease believed to have no connection with the hepatic function.

It is to be remembered that the pancreatic duct joins the common bile-duct just before its entrance into the intestine. This anatomic disposition may seriously interrupt the biliary current when the head of the pancreas is diseased. The outflow of the pancreatic secretion may be impeded by the impaction of a gall-stone in the distal end of the common duct. The following case is an instructive illustration:

Mr. T., of Fall River, aged fifty years, for a considerable period had been a sufferer from biliary obstruction. When he entered the hospital a large tumor could be easily defined below the liver, with a corresponding thickened mass over the head of the pancreas. This was believed to be cancer, and operation seemed doubtful. The gall-bladder contained quite a pint of the mucoid fluid, stained with bile, and over one thousand gall-stones, varying in size from bird- to buck-shot. The head of the pancreas was greatly enlarged and indurated. This, however, began to subside soon after operation. He was discharged at the end of the fourth week. This happened more than ten years ago. Somewhat recently I have heard from him that he continues in excellent health.

Cholecystectomy is not to be advised unless the gall-bladder has become seriously disorganized, or its contents are removed with difficulty. I have never regretted leaving it in any of the cases where I have been in doubt as to the advisability of its removal. It must, however, be considered

that its function is rarely restored after the usual operation for the removal of calculi. I think it wise to consider the gall-bladder containing calculi an infected organ. This is the chief reason why drainage should be continued for a considerable period. After this, the function of the organ is rarely restored, and it is probably wise to remove it oftener than is done at present. Its connection to the liver is only by connective tissue covered by a thin duplication of peritoneum. On tension this grayish-white fold is easily seen. A careful superficial incision is made and by means of a blunt dissector the bladder is removed almost without loss of blood. Introflect this fold by a fine continued tendon suture. The following cases are illustrative, and of interest sufficient to warrant a brief report:

Mrs. E., aged fifty years, had been in fine general health except for frequent attacks of pain in the region of the liver. The last was sudden and acute, with marked jaundice and most distressing suffering. The physician in attendance had treated her, in an expectant way, with hypodermic injections of morphin and saw no reason why a consultation with a surgeon should be requested. I thought the woman in the most extreme danger. She was at once admitted to the hospital and operated upon the afternoon of the consultation. The gall-bladder was filled with a single large calculus, and the entire viscus was necrotic. Although the liver was greatly swollen, the gall-bladder was removed without special difficulty. The patient made an easy recovery.

Miss B., aged forty-five years, for some years has been a confirmed invalid, receiving little sympathy, in the belief that she was a neurotic and wasted her energies over imaginary ills; is thin and anemic; has never been jaundiced; gall-bladder was distended with comparatively small calculi; these were so thoroughly imbedded and fixed to the cyst wall, that an attempt at their removal was ill-advised. The operation was comparatively simple and easy. The

hepatic and the common ducts were not very much changed in size or character. The patient made an easy recovery from the operation, but a long, slow, imperfect convalescence followed. She is still an invalid.

Biliary obstruction of an intermittent type may be caused by a small, moderately close-fitting calculus which is movable in the common duct—the so-called ball-valve obstruction. It is well illustrated in the following case, taken from my hospital records: "Mr. D., aged sixty-three years, an active business man, weighing over two hundred pounds; always enjoying good health. Nearly three years previous had an attack of pain so severe that it caused vomiting, which was relieved by morphin; since that time he has had three other attacks; has seen many physicians: recently Dr. Moore, of Rochester, and Dr. Janeway, of New York City. Both concurred with Drs. Didama, Sr. and Jr., in the opinion that a gall-stone in the common duct was acting as a ball-valve. He was brought to me by Dr. E. A. Didama, of Cortland, N. Y. On entrance mentally bright and general condition good; abdomen stout, not tender under pressure, nothing to be felt. Operation, June 11, 1903, assisted by Dr. Didama and Dr. H. O. Marcy, Jr.; longitudinal incision in right side of the right rectus muscle; opening sufficiently large to admit the hand; liver congested and enlarged; no gall-bladder found in usual position, after long search; deep below the fissure a small, hard nodule was felt between the fingers, but could not be lifted into vision; after much difficulty, separated the parts; found a shrunken, small gall-bladder, everywhere buried in old vascular adhesions; it was saccated and contained a little glairy mucus; dissected it carefully from the liver down to the common duct, bringing a small calculus into the wound; it was a hard, irregular, non-facetted, mulberry stone, the size of a large currant.

Through the opening, introduced a probe, backward and upward into the hepatic duct; through the same opening downward and inward through the common duct; a small,

round, elastic, hollow steel probe was easily carried into the intestine. The verification of its entrance was determined by the injection of water through it. This left really a straight canal, consisting of a greatly enlarged hepatic duct in the upper part, and of a much smaller common duct below. At the junction of these an opening, perhaps a quarter of an inch in diameter, marked the entrance of the cystic duct. Not enough tissue was present to admit the closing of this opening by sutures; from it bile escaped in moderate quantity, therefore a double drainage tube was carefully placed and packed around with iodoform gauze; closed wound as usual.

Fortunately there was very little bleeding; the gall-bladder was slowly dissected away, almost without hemorrhage; rallied well, without vomiting; removed gauze the third day; drainage tube at the end of a week; wound not infected, speedily healed, except at the lower angle, where slight suppuration occurred from skin suture. Digestion at times interrupted; bile in vomitus; plenty of bile in stools; somewhat continuously in urine; otherwise convalescence unbroken." Some years later he was reported well and still in active business.

Assuming that the present consensus of surgical opinion is correct, and that a careful diagnosis of biliary obstruction has been made, the question of importance to the entire profession is, When shall we operate?

The object of this paper is to show especially that the terminal results of operations upon the biliary passages are serious, at the best often imperfect, owing to the pathologic changes which have taken place in the structures as a result of the obstruction. If this be true, but one verdict can be rendered, and that in favor of early operation. It has been truly said, "The easier the diagnosis the worse the prognosis." Every surgeon is constantly seeing cases of biliary obstruction diagnosed by the general practitioner too late to give satisfactory results.

Although operation may be advised therefor, the importance of a correct and early diagnosis is evident. It is the duty of the surgeon to instruct the general practitioner as far as possible; indeed, this service may be far greater to the public than that of his most brilliant operative successes.

As a rule, diagnosis is not difficult. The plain cases constitute a group in which few diagnostic errors can be made. The second group—and most cases may be relegated to one or the other—often demand the highest possible diagnostic skill and painstaking study. The clinical picture may be so obscure that certain symptoms—as intermittent pains in the right upper quadrant of the abdomen—suggest diseases that pertain primarily to the liver, and to interference with its normal functions.

Just here lies the great profit due to the widely experienced surgeon, who has studied a long series of his own operations. Such conditions demand prolonged and painstaking study at his hand. More and more are we individualizing such studies, considering the patient's physical state, his resisting powers—all the factors, indeed, which go to make him a warrantable subject for operation.

It follows without discussion that, although advanced pathological conditions make diagnosis easy, these very conditions render results more unsatisfactory, with a higher percentage of mortality.

Dr. Bloodgood, in a recent article, emphasizes such conditions: "In the later stages of the surgical disease the diagnosis becomes the minor part, the operative surgery the major, and the results, both immediate and permanent, are worse." Here we have the test of operative technique.

The last contribution of our late lamented friend and fellow member of this Association, Dr. Maurice H. Richardson, of Boston, a contribution to the Washington meeting under the title, "Diseases of the Biliary Tract," deserves attention: "The failure to recognize a serious lesion, which early operation can safely and permanently cure, has not,

as yet, acquired in the medical profession, or in the community, the name of disaster; but does it not mean disaster, disability, hopelessness, and death? In some diseases, like cancer in operable localities, such failure means deprivation of the only hope of cure, small though it be; in the biliary tract, it means in most cases disability and untimely death."

It is probably beyond the limits of human skill always to diagnose the presence of gall-stones. By no means is it to be charged to the discredit of a surgeon that upon operation they are not found. Exploratory laparotomy is in itself not specially dangerous.

Something more than ten years ago my clinical records, upon examination, showed that, from various causes, I had opened the abdomen over seventy times when conditions found did not warrant further interference—more commonly, cases of advanced cancer. Since that date this experience has probably been duplicated without a single fatal operative result. It is fair to assume that this is not too large a percentage in about five thousand abdominal operations.

A general infection of the abdomen is less likely to follow in the right upper quadrant, owing probably to the isolation of the parts, due to the barrier presented by the surrounding abdominal organs. When infection takes place from the biliary fluids the Bacillus coli communis and streptococcus are sometimes found. It is well to ascertain if typhoid fever has occurred, as the infective bacteria may become the cause of gall-stones.

The leading surgeons of today have a right to criticise much of our present surgery as both unnecessary and condemnatory. This is doubtless due to the splendid victories of surgery which, for the last twenty-five years, have overshadowed the routine practice of medicine. But let it be said with firm assurance that medicine is coming into its own and bids fair to resume its former leadership.

Our late lamented friend, Dr. Robert Battey, of Georgia,

whose memory is held in deep reverence by every surgeon of the Southland, was the recognized pioneer in the surgery of pelvic organs. Nothing could have pained him more, had he lived, than to see the adoption of his so-called operation by his superficial students, by whom a multitude of women have been operated upon and healthy ovaries and tubes removed.

Out of it all, however, has come truth—settled upon a sure basis—the almost certain diagnosis and comparatively safe removal of the Fallopian tube, in which a variety of micro-organisms have obtained lodgement, threatening disaster.

No one doubts that the operation for appendicitis is being repeated daily when unnecessary. Here again, *when* to operate, rather than *how* to operate, is the problem.

It is not the purpose of this paper to describe the operative technique—I would only urge the utmost care not to overlook a gall-stone which may be so placed as to be difficult of detection. We should remember that this very stone is the probable primary cause of obstruction; without its removal, the operation goes for naught, and the patient is left worse because of it. Theoretically it seems simple to find a gall-stone in the gall-bladder or in the biliary tract, yet few conditions better test the skill of the surgeon.

The abdominal wound should be sufficiently large to admit the hand easily. Every advantage of position should be taken to secure the most careful visual inspection. The trained touch, the *tactus eruditus* of the earlier writers, is nowhere called into higher requisition. I feel more and more assured that a more careful study of the surgical diseases of the abdominal cavity, especially those of a progressive type, in their earlier stages, will not only greatly lessen mistakes, but will broaden the role of surgical intervention. Surgery will no longer be considered as the *dernier ressort* by the patient and his physician, but will be welcomed as giving a bright promise of speedy and permanent cure.

A STUDY OF SOME OF THE UNSATISFACTORY RESULTS FOLLOWING OPERATIONS UPON THE BILIARY TRACT

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It has happened every now and then that a patient upon whom I have operated for some affection of the biliary tract would return with the statement that she (for they are usually women) had been a good deal relieved, perhaps entirely so for a time, of the symptoms for which she had previously consulted me and for the relief of which I had operated upon her; but that for some time past she had observed a recurrence, in greater or less degree, of the same symptoms, or similar ones, to those for which she had sought relief. Occasionally the patient will state that she had been entirely relieved of her original trouble, but that since the operation she has suffered from conditions which, while somewhat different, are possibly even more annoying, or at least fully as much so, as her original trouble. In other words, it has been my experience to have had a not inconsiderable percentage of recurrences, indeed a greater proportion of unsatisfactory results following operations upon the biliary tract than from any other class of abdominal operation, except possible gastro-enterostomy. Malignant disease, of course, is excluded. In the term "unsatisfactory results" I mean to include that group of cases in which one has for some reason or other failed to do what he has set out to do. The patient may be fairly well satisfied, indeed not infre-

quently is; he does not know any better; but, nevertheless, from the surgeon's standpoint, the result remains imperfect. In attempting to find an explanation for this unsatisfactory condition of affairs I have, with the assistance of my associate, Dr. B. M. Bernheim, undertaken a study of all of the cases of gall-bladder disease that have been operated upon in the Johns Hopkins Hospital up to January 1, 1914. For permission to use this material, comprising the work of the entire surgical staff of the hospital, I am indebted to Professor W. S. Halsted. This study also includes all similar cases that have been operated upon at the Union Protestant Infirmary, Baltimore, the majority of which occurred in my own service.

Total cases, 572.

Total cases cured at time of discharge from Hospital, 426, or 74.4 per cent.

Total cases not cured at time of discharge from hospital (persisting sinuses, etc.), 98 or 17.1 per cent.

Cases heard from or examined for this study, 366.

Cases well after varying lengths of time 327, or 89.3 per cent.

Cases not well 39, or 10.6 per cent.

Deaths from all causes, 48, or 8.3 per cent.

Carcinoma cases excluded.

It must be borne in mind that this list includes the earliest cases operated upon and by different operators, members of the house staff as well as the surgical staff, which accounts for the rather high rate of mortality. The rather small number of cases that could be traced out of the total of 572 is accounted for by the fact that so large a proportion of them were operated upon so long ago that they had changed their places of residence and could not be found. The last 100 cases showed much more satisfactory results in every way than the first 100.

A glance at the two tables will show that after a period of years the cured cases are almost 15 per cent. greater than

are shows by the hospital records. A partial explanation of this is that within a few weeks or months after leaving the hospital a large percentage of the sinuses had closed, the patients remaining well thereafter.

In an effort to discover the cause of failure in the 39 uncured cases it was important to know what type of operation had been done in each case. In the 39 uncured cases the operations performed were:

Cholecystostomy	32 or 85.2 per cent.
Cholecystectomy	4 or 10.5 per cent.
Choledochotomy	1
Adhesions	1
Unknown (history missing)	1
	39

When it was discovered that cholecystostomy was largely responsible for the failures (85.2 per cent.), it seemed only fair to find out what was the operation of choice in the successes. The exact type of operation was given in only 282 of the 327 cured cases, and is as follows:

Cholecystostomy	221 or 78.3 per cent.
Cholecystectomy	45 or 15.9 per cent.
Choledochotomy	16
	282

Cholecystostomy was thus the operation of choice in over three-fourths of the failures. It was also the operation of choice in over three-fourths of the successes, there being but seven points difference in the actual percentages.

The question at once suggests itself, Would the percentage of failures have been less than 85.2 per cent. and the percentage of successes greater than 78.3 per cent. had cholecystectomy been the operation of choice in the same number of cases as was cholecystostomy? Until a sufficient number of cholecystectomies has been done and sufficient time has elapsed to allow of a thorough study of end results this

question must remain *sub judice*. The operative mortality of the two operations would have to be considered in any comparison of ultimate results, since it is generally agreed that the immediate risk is two- to threefold greater in removal than in simple drainage of the gall-bladder. But when we add to this the mortality of the secondary operations performed after cholecystostomy, which are undoubtedly greater than those after cholecystectomy, there is probably little to choose from in respect to the mortality rate between the two. The probabilities are, however, in the light of wider experience and fuller knowledge that if better judgment is used in deciding which gall-bladder had better be removed and which had better be drained, and if greater care is exercised in the carrying out of the various steps of the operation and the postoperative treatment, there will arise a midpath which will at all times be open to the well-balanced, thoughtful surgeon, and which will lead to a decreased mortality rate and a lowering of the percentage of unsatisfactory results.

This paper is based largely upon observations and impressions gained from personal experience and from a study of this group of cases. Extended statistical tables have been purposely omitted. I have not attempted to make an exhaustive review of the literature of the subject, but have made full use, in various ways, of the material and observations of other writers upon this subject, especially those of Mayo, Gerster, Ochsner, Crile, Moynihan, Robson, Kehr, Guerry, Riedel, and others. It is apparent that our more or less unsatisfactory experience has not been unique because in the last few years medical literature abounds in articles that have to do with surgery of the gall-ducts, through many of which there runs a very evident vein of dissatisfaction with the results that have been obtained. All observers report a relatively high percentage of unsatisfactory results from these operations. These percentages vary in the hands of different operators, but the average of them all

is relatively high, estimated by Kehr as about 15 per cent. They also vary according to the pathological conditions for which the operation was performed and the particular operative procedure employed. It would seem, therefore, as if a study of this group of cases would not be out of place at this time, and in a society such as this, comprising, as it does, in its membership both physicians and surgeons, for affections of the gall-bladder and ducts concern both alike, constituting, as they do, one of the borderline subjects which demands at all times, in order to secure the best results, concerted action upon the part of the physician and surgeon. One striking fact that stands out prominently in studying this group of cases is that the results in the later years are much better than those of earlier periods. This is apparently true of all the different operators. Why is this? The type of operation until recently has changed very little, cholecystostomy largely predominating all the way through, and for all of the different diseased conditions. The improved technique of the operation and the greater skill acquired by the different operators are, in part, responsible for the better results, but more careful diagnosis and earlier reference of the cases to the surgeon by the physician is the real reason for the improved conditions. The gradual recognition by physicians of the fact that the only really curative treatment for the majority of affections of the biliary tract is surgical is, more than any other factor, responsible for the lessening of the dissatisfaction that has hitherto existed. Moynihan is very insistent that "there is no medical treatment of gall-stones," and that "when once a diagnosis of gall-stones has been made, operation is always indicated unless there are grave reasons forbidding resort to surgery." A somewhat extreme view, perhaps, but one that has much to commend it. With closer co-operation upon the part of the profession and a more enlightened public, continued improvement in our results may be confidently expected.

In studying this group of cases, as we have from various points of view, we have been impressed with a number of facts which seem to be worthy of further consideration. In the first place no one particular cause has seemed to be active in every case of unsatisfactory result. A number of factors are frequently at work, some or all of which are responsible to a greater or less degree for the ultimate results. If I were to try to express in one sentence the general impression received from this study as to the principal cause of dissatisfaction I would say something like this: "Failure to do the proper operation at the proper time and in the proper way was chiefly responsible for our bad results." This at once raises several questions. Should every gall-bladder suspected of disease, other things being equal, be submitted to surgical operation? What is the right operation in a given case? When is the proper time to perform it, and what is the best way in which it should be done? What is the basis upon which the surgeon is to decide these important questions? It is at once evident that one can set no hard and fast rule that will hold in every case for any one or all of these propositions. Here, as everywhere else in surgery, comes in that most important of all considerations, surgical judgment. Every case is a law unto itself and should be decided upon its own merits, after a careful survey of all the facts, and not be blindly following precedent or the prevailing custom or fashion in surgery established by no matter how eminent an authority. If it resolved itself into a simple rule of thumb, it would be easy to decide what is the right operation in a given case, when it should be performed and how. But there are so many factors which must be considered that one can only be guided by the consensus of opinion of those best qualified to judge and by one's own observations and experience in the management of similar cases. One of the first things that strikes one in looking over this group of cases is the relatively large number that were operated upon either for some

suspected biliary affection in which a faulty diagnosis had been made or for some other supposed condition, gastric or duodenal ulcer, or chronic appendicitis, perhaps, and gall-bladder disease found present. In some of these cases no positive diagnosis had been made before operation. It had been performed largely in the nature of an exploratory incision, and sometimes revealed a lesion of the biliary tract and sometimes not. This emphasizes the fact, which is familiar to all observers, that the diagnosis of the various affections of the biliary tract is not always easy. In typical cases, as in the typical case of any class, the diagnosis frequently requires the exercise of no great skill; but in other cases, even after the greatest care and most exhaustive study, one is unable to arrive at any definite conclusion, or if such a conclusion is reached, it may subsequently be found to be at variance with the surgical or pathological findings. Nor do I personally find it always an easy matter when there is reason for believing that a lesion of the biliary apparatus is present to distinguish between the different affections of that tract.

Attention has been so generally directed to the number and variety of lesions that may occur in the upper right hand quadrant of the abdomen that it is an old story. Ulcer of the pylorus and duodenum, the various diseases of the gall-bladder and ducts, appendicitis, stones in or affections of the right kidney or ureter, ulceration or malignant disease of the colon, affections of the right lobe of the liver, including malignant disease and lues, referred pains in this region having their origin in the pelvis and elsewhere, various affections of the abdominal wall and diaphragmatic pleurisy, are some of the conditions the diagnostician is not infrequently called upon to differentiate; and to add to his difficulties, as Mayo has pointed out, is the fact that he has to judge as to the truth of certain alleged facts narrated by the patient, not by an examination of the evidence. for at the time the examination is made there may be no

signs which might furnish a basis for differentiation, as the symptoms complained of may have long since disappeared, Moynihan, too, has called special attention to the prominent part played by the stomach in what he terms the "inaugural symptoms." "It is the stomach," he says, "whose sensibilities are tender, that cries out the warning when other organs are suffering attack."

The presence of slight jaundice does not always help in the diagnosis; indeed it may prove misleading, now by its presence and again by its unexplained absence. Chronic appendicitis, floating kidney, marked grades of visceroptosis, cirrhosis of the liver, and certain septicemias are some of the conditions, in our experience, in which jaundice was present and which, when joined to other suggestive symptoms led to a mistaken diagnosis of gall-stones. There is one comfort, however, to the surgeon in the knowledge that the usual affections which he is called upon to differentiate from gall-bladder disease are in themselves definite indications for a surgical operation. There are exceptions, however, as included in this list are cases of gumma, cancer, and sarcoma of the liver and diaphragmatic pleurisy, which were explored with a probable diagnosis of gall-bladder disease and in which operation was not really needed. In spite of all this, however, and after most careful study of a given case, and an operation has been decided upon, either because in no other way can a definite diagnosis be reached or because the indications are so urgent and the failure of medical measures so pronounced that something must be done and that quickly for the relief of the patient, it will now and then happen that for some reason or other the proper surgical procedure has not been carried out. Let me illustrate: Not long ago I was called upon to operate upon a man, aged thirty-five years, who had been under the care of an excellent physician. He had had repeated attacks which, though never severe, were suggestive of cholecystitis, either with or without the presence of gall-

stones. The physician had not been able to differentiate these attacks from recurring apendicitis. One attack more sharp than the preceding, although similar in character and accompanied by elevation of temperature and localized tenderness at McBurney's point, was so characteristic that the diagnosis which had hitherto been probable cholecystitis was at once changed to appendicitis. Operation was advised and performed by another surgeon and a somewhat inflamed appendix was found and removed. The fundus of the gall-bladder was palpated and nothing abnormal made out. It was not found possible through the McBurney incision to explore the ducts. The patient made an excellent recovery except just before he left the hospital; on the sixth day, he had an attack similar to those he had had previously, which at once raised the question as to whether or not the correct operation had been done. A few months subsequent to this operation he had a sharp attack, accompanied by jaundice, with characteristic epigastric pain radiating around under the shoulder-blade, which rendered the diagnosis reasonably certain of obstructive jaundice, probably due to stone. The patient then came into my hands. Operation revealed a single stone lodged in the cystic duct and of such size as to press upon the common duct. It was removed. The gall-bladder appeared relatively normal. I therefore did not remove it but drained it in the usual way. The patient made an uneventful recovery, except a persistent sinus developed, which has remained patent ever since, about six months. The question naturally arises, Was the proper operation done in the first palce? Was it done in the second place? If the proper operation was done, was it done in the right way? These are questions of the utmost importance. If the correct diagnosis has not been made in the beginning it will be largely a matter of chance as to whether or not the proper operation will be done. If the right diagnosis has been made, are we in a position, at the present time, to lay down any hard and fast rules as to

proper procedure in a given case? To be perfectly frank I am not yet clear in my own mind as to just what one ought to do under certain circumstances. It was this feeling, together with the hope of possibly clearing up some doubtful points, which prompted the study of our results in this class of case. In the case referred to above, should I have done a cholecystectomy? I did not think so at the time; conditions did not seem to warrant it. As careful an examination as I could make, convinced me that there was a single stone. Perhaps I overlooked others. I am perfectly sure that for myself I cannot be certain in every case; that I have been able to detect the presence of every stone, or if I have been able to detect them, that I have always been able to remove them. In this case the gall-bladder looked normal. The bile was a little thick and stringy, the mucous membrane presented nothing abnormal to my eye, and the ducts seemed normal and patent. Why then should the gall-bladder be removed? Are we prepared to accept the dictum of some that the gall-bladder, as the appendix, should be removed every time we see it? Personally I am not yet ready to accept that proposition. All these procedures are not without danger, not always to life, but they may be to the comfort and well-being of the patient. Even in the best of hands the operation of cholecystectomy may be attended with grave risks, immediate and remote. Twice have I been called upon to make the attempt to reëstablish the continuity of a common duct completely occluded, in both of which cases the gall-bladder had been previously removed by another and supposedly competent surgeon, and there was reason to believe that the obstruction to the duct had resulted directly from faulty methods pursued at the time of its removal. The advocates of cholecystectomy will at once say the methods were faulty, that there was no need of obstruction following. True, but here is a situation which did develop and which might result from other causes which when it does occur is an extremely difficult

one to handle. Let us consider then some of the questions which have just been raised. Failure to remove stones when they exist. Is it possible in every case to remove every stone? Is it possible always to find them when present? My own experience compels me to answer both of these questions in the negative. I have had it happen twice that, upon opening the abdomen and palpating the biliary tract with as much care as I could exercise (and the greatest care should always be exercised), I have surely felt a stone in the common duct. Upon subsequently opening the duct and after the most diligent search I have not been able to find it again, and have been compelled to experience the change in of having to close the abdomen and leave the stone. During our manipulation, did it escape into the duodenum or did it recede into the hepatic duct, or liver? A question I cannot answer, but there is good reason for believing that sometimes it follows one and sometimes the other course.

I have a patient in the hospital now who had been operated upon twice before for gall-stones. The first operation performed about three years previously by another surgeon left a persistent biliary fistula. The second, performed by myself, a cholecystectomy, was followed by complete relief for over a year. Recurring attacks of colic accompanied by pain, chills, fever, and jaundice caused him to return to me again for relief. He had a typical and severe attack in the hospital the night before the third operation, a month ago. This case well illustrated the difficulty often met with, owing to the absence of the gall-bladder in finding and freeing the common duct, in case a subsequent operation is necessary after a cholecystectomy. After some considerable difficulty, in facing dense adhesions, the duct was exposed and opened. We had confidently expected to find a stone in the ampulla, as the history had been so characteristically that of the type described long ago by Charcot. Greatly to our surprise a most thorough search of the hepatic and common ducts showed them to be empty. A full-sized

uterine sound passed readily into the duodenum showed no obstruction whatever at the papilla. Very much humiliated we put a drainage tube into the common duct and closed the abdomen. A careful search of the first stool passed after the operation revealed a stone of considerable size. For the first fortnight the patient, an old and rather weak man, drained bile freely, and during this period presented that peculiar but typical picture of marked mental and physical depression which promptly cleared up just as soon as the bile began to flow through the proper channels. This complete loss of bile in old and debilitated patients is an important argument against drainage of the common duct or gall-bladder for too long a period.

I have upon more than one occasion, after having satisfied myself that I had removed all the stones from the gall-bladder and ducts, found a few weeks later, upon the removal of the drainage tube from the gall-bladder, a stone lodged in its lumen or have had one or two smaller stones follow its withdrawal. Is there any way of thoroughly exploring and emptying the biliary tract of stones? I know of none. All writers report a small but appreciable percentage of stones overlooked. It is impossible to estimate the exact percentage, but it is probably not far from 5 per cent. Kehr estimates his own failures at 1 per cent. I always make it a practice to open every gall-bladder and insert a finger into it. With this finger in the gall-bladder and with two fingers of the other hand, one on either side, strip the ducts in both directions, the hepatic downward and the common upward, toward the cystic duct. This same procedure is followed out with a uterine sound in the hepatic and common ducts in order thus to identify them without question. But after all this care I have occasionally overlooked small stones. It is therefore impossible for the conscientious surgeon, when a case returns to him with recurrence of symptoms suggesting the presence of a stone, to salve his conscience by stating to his patient that stones have surely

reformed. That they do occasionally reform, however, there can be no doubt. I have recently operated a second time upon a patient for whom I had operated just a year previously. At that time the patient, an old lady, with a bad heart and kidneys, was suffering from a much inflamed, thickened, and deformed gall-bladder full of stones, which I should have excised but for her poor condition. A year later, after complete relief of her symptoms for about ten months, I was called to see her in an almost identical condition to that which was present when I had first seen her. I operated and found the gall-bladder again full of stones. Had I not thoroughly emptied it at the first operation with my finger in its lumen I could hardly have believed it possible that so many should have reformed in such a comparatively short time. Deaver reports a case from which he had removed a hundred or more stones. Two years later, at the second operation, he removed two hundred more. He very naively adds that he was aware of the fact that he occasionally overlooked a stone, but that he flattered himself that he could not have overlooked as many as two hundred at once. All observers seem to agree that stones do reform, but that this occurs very seldom, and that in the vast majority of cases in which stones have been found and removed at subsequent operations they have in all probability not reformed but had been overlooked. Some authors go so far as to say that they have never seen a true recurrence, among them such excellent surgeons as Riedel and Czerny. It is safe to say, however, that there is always an appreciable percentage of recurrences, probable less than 1 per cent. are the bounds of the most experienced surgeons.

We must draw a distinction between that class of affections of the biliary tract associated with the presence of gall-stones and that class which is not. In spite of the causes already enumerated which may prevent a satisfactory result, namely, failure to find stones or remove them after

they are found, the possibility of their reformation, etc., the problem is a more simple and, in my experience, a more satisfactory one than where affections of the gall-bladder and ducts exist without the presence of gall-stones. It is easy enough, after opening the abdomen because of the more or less well-defined train of distressing symptoms and after inspecting and palpitating the gall-bladder and finding no stones present, to say, "This is a case of cholecystitis," or on palpating the head of the pancreas and feeling it perhaps enlarged and harder than usual, to say, "This is a case of chronic pancreatitis." But what constitutes cholecystitis or chronic pancreatitis? There is no unanimity of opinion as regards the answers of these two questions. One observer calls pretty much everything "chronic pancreatitis," another will remove a healthy looking gall-bladder and call it "cholecystitis."

It not infrequently happens that at the time of operation no adequate cause can be found for the symptoms complained of. Slight thickening of the gall-bladder, a slight turbid or viscid condition of the bile, a few light or dense adhesions binding it to the neighboring structures, may be all that one will find. It happens with such relative frequency in the writer's experience that gall-stones are not found when there is ample evidence for suspecting their presence; that he is at times tempted to join the number of those who go so far as never to make a flat-footed diagnosis of gall-stone disease, but simply to tell the patient that he has an inflammation of the gall-bladder which needs to be operated upon and that incidentally gall-stones may be present. It would seem better, however, to attempt to make a definite diagnosis and to go on record, win or lose, rather than to follow a course which leads so surely to inaccuracy and carelessness in methods of diagnosis. I have for years opposed the idea of disposing of this class of cases by simply calling them indiscriminately cholecystitis or perhaps chronic pancreatitis. It is easy to satisfy the patient or the patient's friends with

such a diagnosis, but it is not always so easy to substantiate it with indisputable evidence. I am glad to see that so competent an authority as W. J. Mayo, in a recent paper, protests against the loose classification under this head of a number of evident pathological conditions which, as yet, are not thoroughly understood. More thorough study of our cases, greater care in making a diagnosis, in differentiating surgical lesions from non-surgical, more close association between physician and surgeon in the study of these cases, will help us, in the future, to classify them more sharply, and thus avoid the chagrin of the surgeon and the needless discomfort and danger attending these operations, slight though it is, upon the part of the patient.

Is not the surgical profession at the present time, in the matter of surgery of the gall-bladder, much in the position that it occupied some years ago with reference to ovariotomy, movable kidney, and gastro-enterostomy for mucous ulcer of the stomach, and as it now occupies with regard to removal of the big bowel and the tonsil, namely, that a lot of unnecessary and discreditable surgery is being done on insufficient evidence. That there is such a thing as cholecystitis, and that it is quite prevalent, more so than was at one time supposed, I am convinced, but that it is necessary or even advisable to remove a great many gall-bladders that are being removed I cannot admit. That there is such a thing as chronic pancreatitis also cannot be denied, but that every pancreas that has a somewhat enlarged possible indurated or knotted feeling constitutes a chronically inflamed gland has not been conclusively shown. After going carefully over the evidence that has been submitted by many observers and after making due allowances, to an unbiased mind, the Scotch verdict "not proven" seems the only fair one to render.

It would seem as if a good deal more careful and scientific work is necessary in the way of the study of the clinical, bacteriological, chemical, and pathological findings in our

cases of gall-bladder disease before we are in a position to be dogmatic as regards the relative frequency of cholecystitis and chronic pancreatitis.

So much confusion of terms exists at the present time that this study will be difficult, as what one writer may call "cholecystitis" or "chronic pancreatitis," another pretty surely would not. As Mayo has well said: "If so much uncertainty can exist with regard to the gall-bladder and its infections, how much more uncertainty must exist as regards the pancreas and its infections? The sense of sight cannot aid in solving the question. The diagnosis must be established by the sense of touch, and a certain amount of intuition on the part of the diagnostician which, unfortunately, often plays too much of a part in his final judgment." Further on Mayo, in the course of the same article, states that it has been his practice for years to examine, with a gloved hand, the entire contents of the abeomen when opened for any purpose, and the condition of the patient will permit such manipulation.

He has been "surprised to find how frequently the pancreas showed enlargement, induration, and nodulation which would have justified a diagnosis of chronic pancreatitis if some portion of the biliary tract had been the original lesion, but in which there was no symptomatic evidence whatever that pancreatic evidence existed." I would like to add to this an observation which I have many times made and recorded that not infrequently where the clinical symptoms simulate closely that syndrone which has been described, and which is generally believed to indicate a chronic pancreatitis, I have been unable to detect any palpable changes in the size, consistency, or structure of the pancreas, and had my attention not been called to it previous to the operation, as a possible explanation of the train of symptoms given by the patient, I should have said the pancreas was perfectly normal. This observation has been verified by Lissauer, who recently reported a series of 24 cases, in which

he emphasizes the association between chronic pancreatitis and alcohol, and brings out the fact that macroscopically there was no disease of the pancreas ascertained. An observation of no little importance. As I have said before the existence of pancreatitis is unquestioned, but I cannot agree with the proposition that it occurs with anything like the frequency or that it deserves anything like the importance which is attached to it by some writers. It is so easy to say and so satisfying to the patient and his friends to give as an explanation for failure to find any satisfactory cause for the symptoms complained of, but is it not really in many cases just a term used as a cloak for our ignorance? More than ten years ago I called attention to a peculiar dilatation of the first part of the duodenum, coupled with certain apparent changes in the pancreas. At the same time the fact was noted that these pancreatic changes were not constant. I felt then and still feel that the only satisfactory explanation of this condition of the duodenum, frequently associated as it is with atony and thinning of the stomach and duodenal walls and occurring as it almost invariably does in patients with a marked neurotic taint, and giving rise to a symptom-complex which involves the stomach, duodenum, liver, and biliary apparatus, and at times the whole gastro-intestinal tract, has to do chiefly with a derangement of the internal secretion of these organs, if such exists, rather than with any distinguishable or demonstrable pathological lesion.

Is not this ill-defined and little understood factor largely responsible in a considerable number of our cases for the failure to completely cure our patient? In the present state of our knowledge no satisfactory answer to this question is as yet forthcoming, but it may well be that some of the indefinite and unaccounted for symptoms occasionally complained of and now referred to the gall-bladder and pancreas may have their origin here. As indicated above the most fruitful cause of recurrence of trouble was this group

of cases of so-called cholecystitis or pancreatitis. It has been found by almost universal experience that the ordinary drainage provided by cholecystostomy does not permanently relieve these cases or, at any rate, a considerable proportion of them. Some of them will return sooner or later with the history of recurrence of the old trouble to a less or even greater degree. Occasionally these cases will show a subsidence of the symptoms just as long as the gall-bladder remains open, but as soon as it closes they promptly recur. What is the reason for this recurrence and what shall we do with this group of troubleseome cases? The reason would appear to be chiefly a chronic persistent infection of the gall-bladder, possibly associated with obstruction in the course of the cystic or common duct, possibly at the ampulla of Vater. There seems to be at the present time no good way of differentiating these cases, that is, those which need permanent drainage and those which do not. What shall we do in the way of treatment? Shall we content ourselves with merely draining the gall-bladder or shall we perform a cholecystenterostomy, as recommended by some surgeons, or shall we remove the gall-bladder in every case? From a study of our cases and the reported observations of others it would appear as if those who advocate the last procedure at the present time have the best of the argument. It is quite as simple an operation as cholecystenterostomy. It has not the advantage of this operation, however, in that it does not provide an additional exit for the bile as the former does. The great objection to cholecystectomy will always lie in the fact that in cases of subsequent obstruction to the common duct the other avenue for the passage of the bile has been cut off.

A study of our group of cases would go to show that in the presence of possible serious injury to the common or hepatic ducts from chronic inflammation, stones, or other trauma it is certainly not safe to remove the gall-bladder, which might subsequently serve the purpose of affording an outlet

for the bile into the intestine through a cholecystenterostomy. Stricture of the common duct or obstruction at the ampulla from any cause are certain most serious complications. No matter how ingenious the operations are that have been suggested for the repair of the duct it must always remain a complicated procedure and one that is attended with a high mortailty rate. Crile has lately called attention to the relatively high mortality associated with all operations upon the common duct, particularly in a certain class of cases. He discusses the cause of death in these cases, emphasizing the fact that in operations upon the common duct we are dealing with no vital organ. Death, he thinks, can rarely be attributed to loss of bile or to the infection of the peritoneum from bile, but is "due to the gradual development of an asthenic state, characterized by a dulness of the mental and motor reactions, a dry tongue, partial suppression of bile, anorrhexia, and scanty urine, together with the impairment of the entire digestive system, a progressive adynamic state which is extremely resistant to any known treatment." This picture, of course, is not exhibited by all common duct cases, but more particularly by those which present technical difficulties of any great degree, either from adhesions, impacted stone, or any other cause that requires much handling or manipulation involving traction upon the duct. He would explain this condition by a traumatic blocking, more or less complete, of the nerve-supply to the liver, which is derived from the sympathetic system, and the fibers of which pass along the bloodvessels and common duct. The speaker has had his attention called many times to the curious mental and physical state that developed after a more or less complete escape of bile through the fistula in the common duct. This condition has invariably cleared up so promptly after the bile has begun to resume its normal course or some of the escaped bile has been returned into the system of the patient after the rectal injection method of Yates that he cannot wholly

agree with Crile's explanation of the phenomenon observed. He would subscribe most heartily, however, to Crile's injunction that in the manipulation of all of the abdominal viscera involved, the utmost gentleness and sharp dissection should be employed throughout, in order to subject the patient to the least possible amount of trauma. This not only tends to lessen shock and functional disturbances of all sorts, but tends in a large measure to limit the subsequent troublesome postoperative adhesions for one of the commonest causes of unsatisfactory results following operations upon the biliary tract, and for which little or nothing can be done, once they are established, is the formation of painful or obstructive adhesions. This factor plays quite a prominent part in our list. Their presence was characterized by a group of more or less indefinite atypical symptoms, long continuing, nerve-racking, and incapacitating. In several cases subsequent operations were performed for their relief, but with only a varying degree of success. I know of but few more discouraging situations for the operator, as well as the patient; owing to the fact that each, as a rule, recognizes pretty clearly the futility of expecting much relief by substituting one set of adhesions for another. There is at present under my care in the Union Protestant Infirmary a woman, aged forty years, who had been operated upon ten times by surgeons for almost all abdominal operations in the category, but the last two or three had been done to relieve the adhesions formed by the previous operations. She finally came into my hands for abdominal pains and partial obstruction of the bowels, which completely incapacitated her. After prolonged search I failed to find any vestige of a peritoneal cavity left; nothing but dense adhesions everywhere. After an experience such as this, who will say that there exists no need for the services of such an organization as the American College of Surgeons? The institution of methods of prevention of adhesions, namely, proper care in the handling of tissues; the dis-

continuance of the use of great force and roughness in handling retractors; the limiting, as far as possible, the amount of gauze used for drainage and the careful protection of that used by wrapping it in gutta-percha tissue; the early removal of drains and the careful covering in of all raw surfaces, either by folding them in on themselves or by covering them with omentum; and care in inserting omentum around and between gall-bladder and stomach or gall-bladder and duodenum, in fact between all more or less fixed viscera which are likely to become adherent to each other. Adhesions between these more or less fixed structures are much more likely to be painful adhesions than those between movable tissues. Is there any choice as to the best time for operation on the biliary tract? In order to arrive at a definite answer to this question, one has but to consider the list of causes of the bad results. In looking over our group we find persistent jaundice, hemorrhage associated with it, infection, pancreatitis, dense adhesions, impacted stones, carcinoma, involvement of the neighboring organs by dense adhesions, all of them without exception late complications. Could anything speak more eloquently in favor of early operation? These facts are either not known by the average physician or are not thoroughly understood by him, for how frequently is it true that patients come to the surgeon with a history of years of treatment by cathartics, diet, salines, sweet oil, periodic trips to well-known watering places, etc., until they are forced by increasing disability resulting from more frequent or more severe attacks or some other intercurrent complication to seek relief. The surgeon is thus not infrequently compelled by the exigencies of the case to operate upon his patient at an unfavorable time and in the face of aggravated and serious conditions which could have been avoided by earlier operation under more favorable conditions. One cannot emphasize this point too strongly. All cases of gall-stone diseases are probably not surgical,

Moynihan's dictum to the contrary notwithstanding; some of them, for one reason or another, surely are not. They ought to be seen by the physician and surgeon together. It is not fair to the patient and it is not fair to the surgeon who has the entire responsibility of the operation not to be allowed to have a voice in deciding as to the proper time for it. In looking over our cases it is evident that the mortality rate is materially influenced, especially in the case of operations on the common duct and where persistent jaundice is present, by the stage of the disease in which the operation is performed, that is, whether the disease is quiescent or whether the jaundice is becoming progressively deeper. That group of cases in which the operation was done early shows a lower mortality rate and a much lower percentage of unsatisfactory symptoms developing subsequently. The only thing that can in fairness be urged against early operation in cases where the symptoms are sufficiently constant and severe is the unboubted fact that well-marked cases in some mysterious way occasionally spontaneously recover, and when this relief does occur the question can always with justice be asked, Was it because of or in spite of treatment?

Every surgeon of experience will agree, I think, to the proposition that a gall-bladder denuded of its mucous membrane, its walls thickened and distorted by chronic inflammation or by adhesions to surrounding structures, its ducts occluded or permanently obstructed, in other words, a structure that is functionally down and out, can only be a source of continued irritation and possible danger from a variety of causes, not the least of which is the development of cancer, and should be removed unless there are strong contra-indications to so doing. Even so it is at times an exhibition of far better judgment to leave such a gall-bladder in a weak and debilitated person and content oneself with simple drainage and the prospect of a possible secondary operation at some future time rather than to stretch to

the breaking point the already overtaxed strength of the patient.

As opposed also to the indiscriminate removal of the gall-bladder in every case one should bear in mind the possible additional functions to those already mentioned that the gall-bladder may perform under certain circumstances either naturally or artificially. Flexner, Opie, and others have called attention to the fact that the mucus secreted by the gall-bladder may serve a good purpose by mixing with the bile and so lessening in a measure possible bad effects upon the pancreas in cases where by obstruction or from whatever cause the bile may be forced into the pancreatic duct. McArthur a few years ago called attention to the therapeutic possibilities of biliary fistulæ as an indirect route to the duodenum and upper bowel, thus permitting the surgeon, if he so desires, to furnish an abundant supply of water or medicated and nutrient fluids to the organism, at the most critical period of the disease, when the mere drainage of septic or toxic products from the liver is insufficient to relieve the strain imposed on the eliminating organs by the general toxemia. Matas more recently has emphasized the advantages that may accrue from this method. He reports several cures of fistulæ of the biliary tract by catheterization of the ducts by means of a large ureteral catheter pushed through into the duodenum. He also corroborates McArthur's recommendation of this method as specially indicated in cases of chronic obstructive jaundice associated with nephritis incident to the toxic effects of cholemia. In these cases it seems to act well in starting promptly an active secretion of urine, thus minimizing the patient's danger.

With regard to fistulæ a study of those observed in our series have usually arranged themselves into two classes, the acute and the chronic, that is, those which spontaneously healed in a comparatively short time and those which persist indefinitely.

Attention has already been called to the fact that many of the cases which left the hospital with a discharging fistulæ subsequently reported themselves as healed, the fistula having closed spontaneously, usually in a few weeks at most. Occasionally it remained open longer and then closed with the discharge of a stone, but this was rare. The rule was that if it did not close promptly it did not close at all. There were, however, a few marked exceptions. A considerable number of our cases were secondary operations to close persistent fistulæ. The cause for the persistent fistula was invariably found to be obstruction somewhere in the cystic or common duct, and usually in the form of a stone, removal of which was followed by prompt closure.

A fact that should not be overlooked in an enumeration of the unsatisfactory feature of operation upon the biliary tract is the rather marked tendency that these cases have toward the development of the condition known as acute dilatation of the stomach. Postoperative nausea and vomiting are perhaps more pronounced after these operations than any group of laparatomies for any other cause, save, perhaps, those associated with well-marked peritonitis. Prompt and persistent use of the stomach tube upon the slightest indication of touble is an excellent routine practice, both as preventive and cure.

Hemorrhage occurred to a greater or less extent in a fraction of 1 per cent. of our list of deeply jaundiced cases. It occurred with greatest frequency in the cases where the jaundice was due to cancer of the head of the pancreas or of the papilla. The coagulation time, as tested, was not always a reliable index as to the danger from hemorrhage. In some cases where the coagulation test was found to be delayed no trouble was encountered. On the other hand in a few cases, where there was little variation from the, normal severe or even fatal hemorrhage followed. The administration of calcium lactate was of doubtful value. Fresh rabbit serum apparently saved one case and helped

others. Transfusion was employed three times with only temporary improvement. The usual result, once the bleeding had begun, was a constant steady ooze that could not be controlled. The presence of subcutaneous ecchymoses and mucous oozing in connection with jaundice is highly significant, and should not be disregarded.

It is interesting to note that two of the cases presented that unusual and interesting phenomenon, colorless bile discharging from the common duct while the patient was deeply jaundiced. Both cases showed cancer of the papilla.

From the nature of the operation, drainage being almost universally used, there will always be an appreciable percentage of postoperative herniæ, but owing to improved methods this percentage was relatively much lower in the later than in the earlier cases.

In conclusion a study of this group of cases leads one to believe that there are a considerable number of unpleasant symptoms that have been observed following operation upon the biliary tract that are not inseparable from it, and that greater care, wider experience, an improved technique, and a riper judgment will gradually render them one after another preventable or eliminate them altogether.

DISCUSSION ON THE PAPERS OF DRS. MARCY AND FINNEY

Dr. Rudolph Matas, of New Orleans, Louisiana.—In connection with the discussion on biliary surgery, I believe it is opportune to again refer to the importance of the gall-bladder and biliary tract (common duct) as an available therapeutic route in meeting some of the most formidable and fatal complications following operations on the gall-bladder and choledochus for the relief of biliary obstruction.

At the meeting of this Association held in Nashville in December, 1910, I presented a paper on this subject and related my experience with the "*McArthur drip*" and a method of *chole-*

dochoduodenal instillation and *infusion through a catheter or rubber drain introduced directly into the duodenum via the common duct.* At that time I related the value of instillation and infusion into the duodenum by either the McArthur gall-bladder drip or by my more direct method of choledochus catheterization. These experiences were fully related in the paper published in the TRANSACTIONS for 1910 and in the *New Orleans Medical and Surgical Journal,* October, 1911. Since that time I have had a number of opportunities to test the value of this method, based upon McArthur's original suggestion, and I will now pass around a number of charts of seven cases in which either the McArthur drip or my direct duodenal catheterization of the common duct was tried. I should have presented other charts of similar cases, but my assistant, Dr. Blakely, was not able to get them all in readiness for the meeting.

These charts attempt to illustrate in a graphic manner the relation existing between the amount of fluid infused through the duodenal route and the amount of urine excreted in the same period of time. These cases were selected because, while the duodenal infusion was given all other avenues for the introduction of fluids into the organism were practically excluded, either on account of gastric irritability and vomiting or by inability to retain the usual Murphy rectal drip. In these cases hypodermoclysis was not resorted to, and only the gall-bladder or common duct was utilized for the introduction of fluids; not only water, but foodstuffs solutions (glucose, laibose, enemose, panopepton, beef tea, etc.), or drugs (digitalis, strychnin, etc.), or purgatives (castor oil, salts, purgative wafers of various kinds, including Carlsbad salts, Hunyadi, Apenta, etc.).

In all of these cases, the chief indication for the duodenal infusion was the danger of dehydration from inability to retain fluids by the usual routes; the need of increasing the urinary output on account of threatened anuria caused by toxic nephritis and the need of diluting the biliary and other poisons which exist in chronic cholemia, especially while the kidneys and other eliminating organs are already crippled by a preëxisting jaundice and toxemia.

These charts refer to the following cases:

1. Mrs. B. B.—A case of chronic calculous cholecystitis, of many years' standing, with cholecystitis and cholangeitis, chills and fever, jaundice, and toxic nephritis. McArthur drip. Recovery.

2. Mrs. J. I. F.—Chronic biliary obstruction by stone in the common duct, associated with jaundice and toxic nephritis. Drainage of common duct into catheter in the duodenum, followed by duodenal infusion and by rapid increase in the urinary output. Recovery.

3. Mr. M. K.—Aged thirty-five years. Chronic cholecystitis, with stricture of the common duct. Dilatation of the common duct by catheter introduced into the duodenum. Threatened suppression of urine. Duodenal infusion. Recovery.

4. B. T.—aged sixty-six years. Chronic obliterative cholecystitis calculus in common duct with cholangeitis. Common-duct drainage, with drain introduced into duodenum. Duodenal infusion. Death on second day from pulmonary embolism and acute edema of lungs. Urinary output good.

5. D. W.—Carcinoma of head of pancreas, obstructing common-duct at papilla of Vater with a Courvoisier gall-bladder. Cholecysto-enterostomy, with direct infusion into duodenum by catheter introduced through the new stoma and cholecystostomy opening. Death on the thirty-first day from colliquative or pancreatic diarrhea, cachexia, and marasmus. The direct relation existing between the urinary output (a veritable polyuria) and the amount of fluids taken by infusion is remarkably well shown in this case, the urinary output only diminishing toward the end when the diarrhea stopped all absorption of fluids.

6. Mrs. J. L.—Aged thirty-five years. Chronic stricture of common duct with typical hepatic fever following after primary cholecystectomy for gall-stones. Choledochus drainage by catheter introduced into the duodenum, followed by direct feeding and infusion into the duodenum. The patient suffered with the most persistent vomiting, which prevented the administration of all foods by mouth for nineteeń days, during which she was fed systematically by the duodenal route with nutrient solutions and liquid foods. She was not only fed but medicated with purgatives, etc., by this route. In this case the immense superiority of duodenal infusion over the usual proctoclysis was conclusively demonstrated, not only by the copious urinary output but also by the excellent condition and state of nutrition of the patient during the nineteen days that the duodenal feeding was resorted to. After vomiting ceased the catheter was removed from the common duct and the wound healed promptly; the patient convalescing with great rapidity. There

was never any vomiting or regurgitation of the fluids infused through the duodenal catheter.

7. This most interesting case is that of a little boy, A. G., aged nine years, who was operated for an acute perforative appendicitis with peritonitis. The appendectomy and drainage were followed after apparent improvement, on the seventh day, by an acute toxic nephritis, which threatened a complete suppression of urine. The boy vomited incessantly and would expel all rectal drips. He was restless, tremulous, and in stupor, with all the signs of impending uremic convulsions. We then decided to try the effect of the McArthur drip in the gall-bladder for diuretic purposes. A cholecystostomy was performed under gas-oxygen anesthesia, and a retention catheter was placed in the gall-bladder, through which a 5 per cent. glucose-soda solution drip was immediately begun. The effect in increasing the quantity and improving the quality of the urine was marvellous. The condition of the boy improved so rapidly that the drip was discontinued. An immediate drop in the urinary output followed by vomiting, with the presence of albumin and casts in the urine. The drip was again resumed and again a marked diuresis and general improvement followed. On the third day the drip was again discontinued and the boy this time continued to convalesce. Four days after the Pezzer catheter was removed from the gall-bladder and five days after the boy was allowed to return home with the cholecystotomy wound practically closed. The boy was examined a few weeks ago. He was perfectly well, without a trace of his former nephritis.

This, I believe, is a unique case in which a cholecystotomy was done solely for the purpose of applying the McArthur drip. It now seems plain enough from the fact that it was only by the free supply of fluids into the organism by this route that the boy was rescued from the fatal consequences of an acute suppression of urine and uremia.

It will not consume more time by the discussion of the technique, which is fully described in Dr. McArthur's papers, and in my previous contributions as they have appeared in the TRANSACTIONS of this Association and elsewhere. I can only add that the McArthur drip applied with a retention catheter in the gall-bladder is only applicable to cases in which the cystic and common-ducts are open and patulous. The direct duodenal method of infusion, which I resort to, is applicable to all cases of common duct drainage, either with an ordinary soft

rubber catheter of appropriate size, or with the T-tube of Kehr. The fear of infection of the bile tract by contamination with duodenal contents is amply disproved by the experience I have related.

One fact remains, namely, that nowhere is absorption so active as in the upper duodenum. Whoever has had occasion to test the efficiency of the upper, as compared with the lower intestinal (rectal) route as avenue to the circulation, must be convinced that this, in a physiological and clinical sense, is infinitely the more efficient and preferable, whensoever it can be made available for the purposes of the surgeon.

Dr. Le Grand Guerry, of Columbia, South Carolina.—At the Hot Springs (Virginia) meeting of this Association, I read a paper on a plea for the more general use of cholecystenterostomy in certain casesof pancreatitis. That paper, so far as I have been able to learn, has never received any attention. I wish, however, to address a few remarks directly to a very large group of cases in which all of us, or many of us at least, do not get the results in the drainage of gall-bladder cases that we should. In a recent review of this subject in the *Boston Medical and Surgical Journal*, there is a report of 27 per cent. of failures to cure in drainage of the gall-bladder in which no stones were found. I do not feel that we have any measure by which we can be certain before operation that a patient has a chronic or interstitial pancreatitis. In view of these facts, I wish to relate the cases I have had of this sort up to date, which number fifteen in all. The fifteen cases in which I did a cholecystenterostomy are divided as follows:

(1) Five patients were operated on because they had a permanent biliary fistula which had lasted from one to four years. (2) Five cases underwent operation for permanent drainage after they had been operated on, two of them three times and three of them twice by simple cholecystotomy. (3) We have ventured to be bold enough in the five other cases to do the operation of permanent drainage at the primary operation. The point I wish to make is this: In these cases as long as the biliary fistula was open they remained well. Immediately on closure of the fistula the syndrome of symptoms began anew, they had a gradual exacerbation of the symptoms that caused them to complain and be operated on as in the first instance. I do not know, and I am not pretending to say, exactly what is the matter with these cases.

I know this, that in all fifteen of these the choledochus was patent, and I know it was patent because a common duct probe was passed through the common duct into the duodenum. We also know the additional fact which we cannot help but feel is significant, that whereas none of them were cured by cholecystotomy, all of them with one or two exceptions have remained permanently well, and are well today, since they have had a side-track operation and permanent drainage in the form of cholecystenterostomy.

With this clinical experience I cannot resist the belief that there are certain of these cases, as was pointed out by the late Maurice Richardson, that have symptoms without gall-stones. In 27 per cent. of the cases reported to the Massachusetts General Hospital they failed to effect a cure. A certain proportion of these 27 per cent. of cases not cured will possibly be cured by the operation of permanent drainage.

Dr. James E. Moore, of Minneapolis, Minnesota.—The older I grow in experience, and I have had forty years of it, the more I feel my responsibility when I open the abdomen. I mention that fact in the light of the two papers read this morning, one by my senior of many years, and one my senior in experience. I want to comment upon a point I have made so frequently, that this land is full of men who have a legal right, but not a moral right, to open the abdomen, who are still doing it in spite of the lack of moral right that leads up to the fact that we have a large class of men who are constantly making diagnoses with the knife. They see something wrong with the abdomen and they have got to open it. There is a legitimate field for the exploratory incision. I was in hopes that Dr. Finney would tell me just when to do that. He said he wished he knew, and I wish I did. I believe an exploratory incision is never justifiable until we have exhausted all known means of diagnosis. When I arrive at that point I become honest with my patient. I throw up my hands and say: "I do not know just what the condition is inside; it may be one of two or three conditions, but there is something seriously wrong that in my judgment demands surgical interference, With your permission, I will make an opening through the abdominal wall which in itself is not dangerous, and I believe the chances are I can find out, and if so, I shall relieve your suffering. Failing to find anything demanding operation I will close the abdomen, and you will be no worse off than you were before."

Incomplete operations. One thing that has helped us to become more complete in our work than in the past is that this is a day of large incisions. When we all prided ourselves on being able to make a little hole in the right lower quadrant of the abdomen, stick the finger in and pull out the appendix, we thought we were doing a great thing. After a little while we found some of these patients came back and were no better, or commonly they would go to some other surgeon to find out what was troubling them. We did not explore the abdomen, but simply took away the appendix, leaving other pathological conditions inside. Our failure in the past has led to large incisions which is a common practice among surgeons today. A large incision will heal just as quickly as a small one.

As to the recurrence of stone, I am glad Dr. Finney brought up that point. I laid the sweet unction to my soul, when a patient did not do well after operation of believing that the gall-stones had reformed. But honestly, gentlemen, I know of only one case in all my experience in which I could conscientiously say a stone had recurred. In other instances I have unquestionably left them. In one case I emptied the gall-bladder of a large number of stones, and three years afterward the symptoms recurred, I opened the man's abdomen, opened the gall-bladder, and found a large number of those little yellow stones, evidently of recent origin. That is my only case of recurrence of stones.

Dr. A. J. Ochsner, of Chicago.—The point Dr. Marcy brought out at first concerning infection, which is the primary cause of gall-bladder disease and gall-stones, we are thoroughly familiar with, because we can in almost every case trace back the condition to some intestional infection. Whether the infection is caused by the ability of the colon bacillus or typhoid bacillus to wander up the common duct through its own motility during the acute stage of intestinal infection or whether the infection is through the circulation, through the portal system, and through the liver, has been fully discussed. Just now infection from the urinary bladder up the ureter has received a great amount of experimental and clinical study, and it seems as though infection there does not proceed against the stream as we had supposed, but that it extends by way of the lymph spaces underneath the mucous membrane of the ureter.

The literature and experimental facts have been summed up in a paper by Dr. Eisendrath, which is to appear in *Surgery*,

Gynecology, and Obstetrics, so I need not go into the details of this because it would lead too far. But from an analogy in the two cases it seems probable that when the experiments have been made, it will be proved that this is the manner in which infection also takes place in the case of bile ducts and gall-bladder.

The next point that was made concerning the time of operation in acute cases. We have observed a very large number of very violent acute cases of cholecystitis and biliary colic, and the pain in these cases is due to a contraction resulting from the passage of some substance which may be food or it may be mucus from the stomach through the duodenum. In passing the papilla you have this spasm which gives rise to the colic. I have demonstrated in a very large number of cases that the biliary colic will subside provided you stop everything from passing the papilla. In many cases in which one quarter grain of morphin or more will not stop the colic, The pain will stop immediately if you remove everything that is in the stomach by gastric lavage and do not permit anything to be placed in it. You can wash out the mucus thoroughly with hot water to which some phosphate of soda has been added. It is important to continue the lavage until the stomach is clean. After this is done, these patients will go to sleep and perspire; there is relaxation of the gall-bladder and stoppage of the pain, and you will not have to operate on these cases during the acute attack. We have not had a case of rupture of the gall-bladder since we began to use this method except in cases in which this condition exists at the time of admission twelve years ago. In that way, I believe, we will avoid a great many cases in which we would otherwise have a cholangitis following the operation upon the gall-bladder. During the time I acted as an assistant I noticed that when we probed the common duct in acute cases we frequently had cholangitis, so that evidently the cholangitis was due to an infection which passed up the lymphatics as a result of wounding some portion of the lining of the common duct, and that in corresponding cases in which we did not unduly manipulate the duct and did not probe it, we did not have cholangitis. We have abandoned this practice entirely in cases in which there is still present some degree of acute infection.

Dr. J. Garland Sherrill, of Louisville, Kentucky.—There is one phase of this subject which Dr. Finney unfortunately did not have time to go into thoroughly, and one that has interested

me, and that is the development of cancer in connection with these cases.

Some years ago I made a report upon the subject of cancer of the gall-bladder, and in looking up the literature I found Slade had made a study of a number of cases of gall-bladders removed postmortem, and he found in 33.3 per cent. of the gall-bladders there was evidence of cancer. Schaefer reported 14 per cent. in his series of operative cases. I have had a rather high percentage myself of cancers in operative cases. Since that time, probably because of the fact we are getting these cases earlier and they have not reached the chronic stage, I have not had anything like the percentage of cases of carcinoma connected with gall-stones.

I would like to hear from Dr. Finney and any of the other speakers who may have had some experience along this line as to whether after a primary cholecystostomy they ever find it necessary to remove the gall-bladder for carcinoma. It has been my experience that after you have done a drainage operation and relieved the irritation, it has not been necessary to remove subsequently the remains of the gall-bladder for cancer. Irritation in these gall-bladders going on for a number of years is likely to result in cancer, and this may be considered a strong argument for the operation of cholecystectomy.

With reference to the question of an exploratory operation, I am strongly in favor of a correct and accurate diagnosis before invading the abdomen. We all know, if we are conscientious, that we cannot in every instance make such a diagnosis.

Just before leaving home I had occasion to see a patient and was just ready to send her home, believing she needed further study before being subjected to an operation. The members of her family said she had had enough suffering, and they insisted upon my making an exploratory operation. Briefly, the symtoms were pain in the epigastrium, with a little nausea and vomiting, some loss of flesh, clay-clored stools, one test giving occult blood in the stool, and another being negative, free fat was present in the stool, but there was no tenderness except during one examination over the gall-bladder. I was doubtful as to the condition. There was no fulness or enlargement over the head of the pancreas. At operation twelve or fifteen small stones about the size of a grain of wheat were found with an infected gall-bladder and adhesions leading over to the pylorus which caused constriction. A skiagram of bismuth in the

stomach and fluoroscopic examination showed a small excavation of the stomach, giving us a strong suspicion that she had an ulcer or a carcinoma. The woman is now on the way to recovery. In cases of this kind where we are in doubt and the patient is suffering considerably, it is justifiable to make an exploratory operation.

Dr. Samuel J. Mixter, of Boston, Massachusetts.—In his paper Dr. Finney raised the question of diagnosis. It seems to me, when the medical man stops sending cases to Carlsbad for recurrent attacks of pain in the upper right quadrant of the abdomen, we shall get earlier diagnoses and better treatment.

As to the attacks of pain that Dr. Finney refers to occurring after operation. I can only say that in the cases I have operated on and studied afterward, the patients had fewer attacks of pain occur where the gall-bladder has been taken out than where it has been drained.

The question of reformation of stones is one of interest. I have seen one case where I believe stones reformed. I think Dr. Finney may remember it, a case where Homans operated and sewed up the gall-bladder, we had a string with little beads of gall-stones. The specimen is now in the museum. I think that is the only case where I can surely say the stones had reformed.

Dr. Charles H. Mayo, of Rochester, Minnesota.—The two papers to which we have just listened are fruitful and have provoked a most interesting discussion. When Nature has made a fistula from the gall-bladder into the bowel or stomach, or when we have made one, if the stones have any obstructive tendency, it will not maintain two openings. The closure of the fistulous tract may account for two or three of the failures re-reported by Dr. Guerry.

Dr. Matas had a most remarkable case of a boy whom he really restored to health by the McArthur drip method in the gall-bladder, and it brings to my mind one point I want to make in connection with the acute surgical kidney. I have seen just that type of case in which by bringing up the two kidneys, decorticating them, taking a three-cornered needle and making about twenty-five stabs over the kidney and putting it back, there will be an enormous output as soon as the kidney can drain itself. It is a point well worthy of remembrance in connection with what Dr. Matas has said.

Dr. Finney spoke about adhesions. In one case we found a little adhesion as the cause of the obstruction. When an adhes-

sion makes trouble, it is usually an adhesion of some viscus whose lumen is obstructed by being adherent to a fixed point like the liver. It does not matter how much adhesion there may be in the abdomen, if it consists of fat between various organs, there will never be any trouble from that cause. Dr. Finney's paper has reminded me of a great amount of unpleasant surgical work, and, if time permitted, I could refer to a few things he left out.

As to the question of pancreatitis and sudden recurrence: I operated on a patient last week that was first operated on seven years ago, when I made a cholecystostomy, removed the stones, and drained the gall-bladder. The woman remained perfectly well for five years. Last week I found the gall-bladder full of reformed stones. They were yellow in color and entirely different from those removed at the former operation. We have observed such cases several times. Other patients have come to us bringing in boxes the stones which other doctors had removed.

As to mistakes in diagnosis, we cannot help them. The only man who does not make a mistake in diagnosis is the gastro-enterologist.

Dr. Finney has brought out another good point on pancreatitis to which I want to refer. In many cases we carefully develop a diagnosis of gall-bladder diseases and do not find gall-stones at operation. A blue gall-bladder may have stones, but there are many cases of strawberry gall-bladder, also blue gall-bladder with thin walls, free from adhesion, in which there is an acute infection, though the organ appears healthy. The first thing to decide in these cases is when to remove the gall-bladder. One of the serious propostions which confronts the surgeon is when is the evidence sufficiently justifiable for him to open the abdomen?

Dr. Goodrich B. Rhodes, of Cincinnati, O. (by invitation).— A number of years ago I operated on an interesting case that six years before had been operated on by Dr. H. J. Whitacre for cancer of the breast. Both breasts were removed. I saw the case about five years afterward and the condition at the time was an ascites which had been tapped and recurred. I naturally supposed the case to be one of retroperitoneal metastasis, and regarded it as such for some time, in which opinion I was sustained by three other men. The case went on for a year with no symptoms whatsoever, simply an ascites, which occurred regularly every week after tapping a considerable quantity of

fluid. My diagnosis was portal vein obstruction from glandular metastasis. The family urged me to do a laparotomy for exploratory purposes. I refused to do it because the woman was in a critical condition and I could see no advantage in doing it. The following year she went on without symptoms, then had belching and slight upper abdominal pain which I took to be from pressure. At the end of another month she began to have rather an acute pain in the upper abdomen. Much against my judgment I went in, and I found to my surprise three tremendous gall-stones, the apex of the pyramid being an impacted stone in the cystic duct. The tumor mass produced by these stones had impinged on the portal vein and had produced ascites. There were no cobwebs in the attic, to use Dr. Robert Morris' picturesque metaphor.

In searching the literature carefully I could find no instance of a similar case, in which pressure on the portal vein by gall-stones was the causative factor of ascites.

In regard to the question of the etiology of gall-stones, it might be interesting to recall the theory and production of gall-stones by Dr. Kramer, of Cincinnati. Some years ago he reported in the *Journal of Experimental Medicine* the experimental formation of gall-stones, which he produced by the interaction of the metabolic products of bacteria common in the upper abdomen with the bile, producing typical gall-stones. It is very probable that no gall-stones will reform during the period of efficient drainage, but there is no reason to suppose the same condition will not recur after the gall-bladder is closed permanently.

As to the length of time it takes for gall-stones to form, Dr. Kramer found they formed inside of a few weeks, so it is not improbable that gall-stones can form again in the closed gall-bladder in a short time.

Dr. Matas brought out an important point, and it would be an interesting thing if we could only be granted the opportunity to go over some of our patients with the same pathological conditions and use a different method of treatment. I think we might get similar results and not be misled as to the efficacy of one method of treatment. It would be an interesting thing if Dr. Matas would treat some patients, giving intravenous or rectal infusion, preferably of Fischer's solution. In Cincinnati we have been brought under the sway of Dr. Martin Fischer because of his able advocacy of his theory of acidosis in the

production of nephritis and edema. We see some remarkable results, both clinical and experimental with the use of carbonate of soda solution in the toxic nephritides, puerperal exclampia, and in septic conditions.

As to the McArthur drip, I have not had any experience with it, but if you consider the absorption of water is greatest in the large intestine, and the absorption of solids greater from the small intestine, the logical procedure would seem to be put into the rectum by the Murphy drip, or the Fischer solution.

Dr. Marcy (closing the discussion on his part).—If for no other reason, Dr. Finney and I can congratulate each other that we have brought out a very important discussion. There have been so many points brought up in connection with this subject that we could easier write a book about them. We have all had a good many failures, and the principal object of this discussion, I take it, is to obviate them in the future. One or two things have been emphasized by this discussion. Dr. Finney referred to the word cure. Really a cure is that which will allow a free flow of bile into the intestine, and this is one of the important reasons why we should operate early. Although we may remove the gall-stones, we may not restore the patency of the canal, and this is always to be kept in mind. Of the 15 per cent. of cases alluded to, we can charge nearly all of them to delay in operation. These patients should come to us earlier for operation. Unfortunately, as has been said, they come to us late, and criticism can be raised in that respect. I am sure, as Dr. Richardson pointed out in his paper two years ago, that we should operate early, after studying carefully and determining what all the factors are, so as not to have such changes occur pathologically as will destroy the possibilities of bringing about a cure. I am reminded of a case in this connection.

A man was sent to me in most extreme condition. He had a large tumor in the right upper quadrant of the abdomen. I removed over a thousand gall-stones many of them very small, with much free fluid; but the point I make in reference to the pathology is that the pancreas was very much enlarged. This was determined before operation, and naturally it was supposed the patient had a cancer of the head of the pancreas, and I hesitated about operation. Although the operation was done ten years ago, the man remains well, showing it was an obstruction to the outflow of the pancreatic secretion that gave trouble, which was induced by pressure of the gall-stones.

In reference to the stone named by the late Dr. Fenger, of Chicago, as being of the ball-valve type, I will say that one of the most difficult cases I ever operated on was of this type, and the gall-stone was not larger than a large buckshot. It was removed. The man today is thoroughly well. He had been the rounds of surgeons in New York and other cities. It was difficult to find the calculus because he had a large thick abdomen, but this little ball-valve stone sometimes absolutely cut off the outflow of bile, while at other times the man was well. These are illustrations of some of the more difficult cases we have to deal with. It emphasizes the point that we should study our cases carefully and have as far as possible a thoroughly accurate knowledge of conditions.

When in doubt an exploratory operation may be advised. I have made explorations of the abdomen over one hundred times, which is a comparatively small number in view of the fact that I have opened the abdomen about 5000 times. Every one of these cases made an easy recovery.

Emphasis should be made that the incision is sufficiently large to be sure we have the tract under visual as well as tactile inspection. It requires an expert to do this kind of work, and not the man who may be designated as the occasional operator.

Dr. Finney (closing the discussion).—The discussion brought out by the paper of Dr. Marcy and my own has been most illuminating, and the points that have been made by those who have discussed the subject have been most valuable.

Dr. Matas' point in regard to the McArthur drip, an idea further elaborated by himself, is certainly one of the most valuable of the recent procedures that have been introduced into abdominal surgery. It is second only to the Murphy drip, although its range of applicability is not quite so great.

Dr. Guerry, with his well-known modesty, brought out a valuable point, and one that has not been sufficiently recognized, a point which I think it is well to emphasize strongly.

As to the remarks made by Dr. Moore concerning the proper size of the abdominal incision, I think everyone who is doing abdominal work is more and more impressed with the value of that suggestion. I am sorry that the first reporter, Dr. Crile, is not here so that we might have a little of the other side of that question.

Dr. Ochsner's reference to the question of biliary infection and the idea of gastric lavage, which was enunciated by him some

years ago, needs no further discussion. It has proved itself of such value, particularly the starvation and lavage treatment, as to require no further comment here.

Dr. Sherrill's question as to cancer developing after the gall-bladder has been drained is one with which I have had no experience. I have come across such cases in the literature, so it is a possibility.

Early diagnosis, as emphasized by Dr. Mayo, is of the greatest importance. On that point hinges the question of result. The earlier the operation the better the result. That goes without saying.

Dr. Mayo's remarks on the function of fat in the question of abdominal adhesions reminds me of a rather interesting experience I had on one occasion. I read a paper entitled "The Role of Fat in Surgery." I sent that title to the secretary of the meeting, and was horrified to receive a postal card some days afterward which stated that I was to read a paper upon the "Roll of Fat in Surgery."

What Dr. Mayo said about enlargement of the group of glands about the common duct and cystic duct is very helpful. I have had occasion recently, since he first called attention to it, to prove its value. I think it is a very important point, and one well worthy of emphasis.

CHARLES MAYRANT REES, M.D.

IN MEMORIAM

CHARLES MAYRANT REES, M.D.

Dr. Charles Mayrant Rees died at his home in Charleston, South Carolina, on November 15, 1913, at the age of fifty-three years, after an illness of one year. He was an uncomplaining sufferer, the condition of his health being known to only a few of his most intimate friends, and he continued his labors within a few days of his death.

He was elected to Fellowship in the Southern Surgical and Gynecological Association in 1910.

Dr. Rees was born at Statesburg, South Carolina. He was graduated from the Medical College of the State of South Carolina with the degree of Pharmacy in 1883, and in 1887 received the degree of Doctor of Medicine from the same institution. He was elected professor of principles of surgery in the Medical College of the State of South Carolina in 1908 and continued to occupy this chair until the college was reorganized in 1913 and conveyed to the State of South Carolina, when he was chosen to fill the chair of general surgery. He was at the time of his death visiting surgeon to the Roper Hospital and gynecologist to the Shirras Dispensary.

Dr. Rees was an ex-President of the South Carolina Medical Association and an ex-President of the Medical Association of South Carolina, Charleston County. He was a member of the American Medical Association, the

Southern Medical Association, and the Tri-State Medical Association (Carolinas and Virginia), member of the American Association of Obstetricians and Gynecologists, and a Commissioned First Lieutenant, Medical Reserve Corps, United States Army.

Dr. Rees was a faithful and conscientious worker; he was noted for his candor, and was an ornament to his profession. In his death the profession and his friends have sustained a loss.

Dr. Rees is survived by a widow and two daughters.

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